VISIT…

1 3 Brothers

Puzzle Goal:

Open each of the drawers

Materials:

walnut, tamo, etc.

Classification: Take apart

Copyright © 2002 IPP Design Competition
All rights reserved.

1 3 Brothers

Puzzle Solution:

Stack the 3 drawers on top of each other. Regardless of the order, you can always open only the middle drawer. And can listen to the music of the opened drawer.

Copyright © 2002 IPP Design Competition
All rights reserved.

2 Arched Bridge

Puzzle Goal:

Slide the bridge frame to one of 6 different positions, then use the "brick" pieces to build the road across the bridge.

Materials:

Wenge, mahogany, and hard maple

Classification: Put-together puzzle

Notes:

The designer looked for a way to put some restrictions in polyomino pieces without playing with differed colors. He had the idea to form an arch so you can orient the pieces only 2 ways.

Copyright © 2002 IPP Design Competition
All rights reserved.

2 Arched Bridge

Puzzle Solution:

1 of 288 solutions

I	E	E	L	L		J
I	I	E	E	L		J
M	I	H	K	L	J	J
M	H	H	K	K	F	F
M	H	C	K	F	F	B
M	C	C	C	B	B	B
G	G	D	A	A	A	A
G	G	D	D	D		

1 of 87 solutions

C	C	C	H		G	G
I	C	H	H		G	G
I	I	H	J	J	F	F
M	I	K	J	F	F	B
M	K	K	J	B	B	B
M	D	K	E	E	L	L
M	D	D	D	E	E	L
A	A	A	A			L

1 of 76 solutions

B	B	B		I	L	L
B	E	E		I	I	L
M	K	E	E	C	I	L
M	K	K	C	C	C	J
M	K	A	A	A	A	J
M	H	D	D	D	J	J
H	H	F	F	D	G	G
H	F	F			G	G

1 of 107 solutions

G	G		I	C	C	C
G	G		I	I	C	H
A	A	A	A	I	H	H
D	D	D	E	E	H	M
J	J	D	B	E	E	M
J	B	B	B	K	L	M
J	F	F	K	K	L	M
F	F			K	L	L

1 of 107 solution

M		E	E	D	D	D
M		C	E	E	I	D
M	C	C	C	K	I	I
M	F	F	H	K	K	I
F	F	H	H	K	L	L
J	J	H	B	G	G	L
J	B	B	B	G	G	L
J			A	A	A	A

1 of 1202 solutions

	A	A	A	A	B	M
	F	F	B	B	B	M
F	F	I	C	C	C	M
J	J	I	I	C	H	M
J	G	G	I	H	H	K
J	G	G	L	H	K	K
D	D	D	L	E	E	K
		D	L	L	E	E

Copyright © 2002 IPP Design Competition
All rights reserved.

3

Block Box

Puzzle Goal:

Open the box.

Materials:

Sapele and Maple

Classification: Take-apart, sliding block Puzzle

Notes:

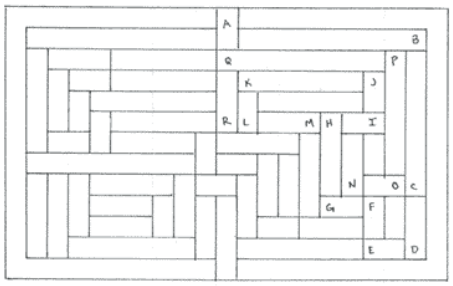
There are four different ways to preset the sliding blocks. Each setting is of increasing difficulty, and has one unique solution. The hardest setting takes 81 moves (not including the final lid opening up). The next settings are 53, 38, and 15 moves.

Copyright © 2002 IPP Design Competition
All rights reserved.

3 Block Box

Puzzle Solution:

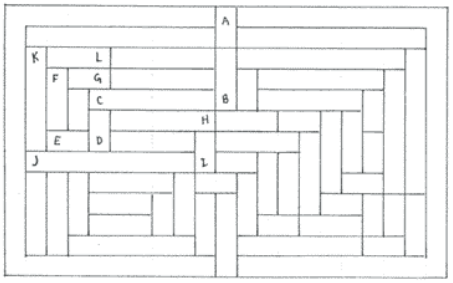
Slide the blocks on the top of the box in the correct path. See solution diagrams below:



VERY HARD SETTING 81 MOVES

SEQUENCE:
A B C D E F G H I J K L M I
N O P Q R M I H G F E D C B A

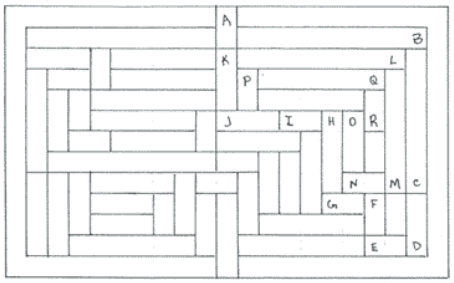
CHANGES BOX TO 'HARD' SETTING



HARD SETTING 53 MOVES

SEQUENCE:
A B C D E F G D H I J K L
D C B A

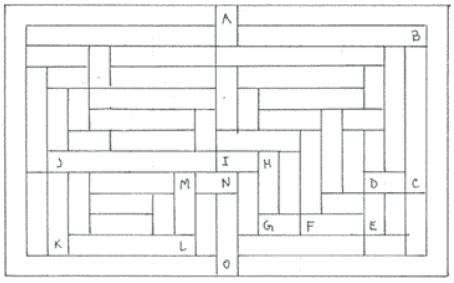
CHANGES BOX TO 'MEDIUM' SETTING



MEDIUM SETTING 38 MOVES

SEQUENCE:
A B C D E F G H I J K L M N O
I P Q R I H G F E D C B A

CHANGES BOX TO 'EASY' SETTING



EASY SETTING 15 MOVES

SEQUENCE:
A B C D E F G H I J K L M N O

UNLOCKS LID

NOW OPEN LID

Copyright © 2002 IPP Design Competition
All rights reserved.

4 Bottle Puzzle

Puzzle Goal:

The neck and the shoulders of the wooden bottle revolve separately and freely, both clockwise and anticlockwise. The puzzle is to release an airline-type miniature glass liquor bottle inside.

Materials:

African blackwood with a boxwood cork

Classification: Take-apart Puzzle

Notes:

Once solved, the puzzler should celebrate with a drink, and then replace the empty bottle with a new miniature bottle of their choice!

Copyright © 2002 IPP Design Competition
All rights reserved.

4 Bottle Puzzle

Puzzle Solution:

Just above the base of the bottle is a circular mark in the wood. Grasp the bottle by the neck in the right hand and old it horizontal to the ground with the circular mark pointing directly at the body. Smack the bottle firmly into the palm of the left hand and then, still holding the bottle horizontally across the body, rotate the collar of the bottle in a clockwise direction until a catch engages. Continue to turn in this clockwise direction until the collar unscrews and releases the miniature inside.

To reassemble: After inserting a new miniature (if necessary), check that the revolving inner compartment is still in the locked position and screw the collar (with the neck inside) in a counter-clockwise direction until tight. Then, holding the bottle horizontally, aim the circular mark now directly away from the body, and again smack it sharply into the palm of the left hand. This should disengage the lock and allow both neck and collar to rotate freely. A little practice will establish the weight of the smack required to lock and unlock the mechanism.

Copyright © 2002 IPP Design Competition
All rights reserved.

5 Bundle of Wood

Puzzle Goal:

Remove all 9 wooden pieces and the gold locking pin from the carrying frame. Mix them up and then put them all back into the frame so none will fall out.

Materials:

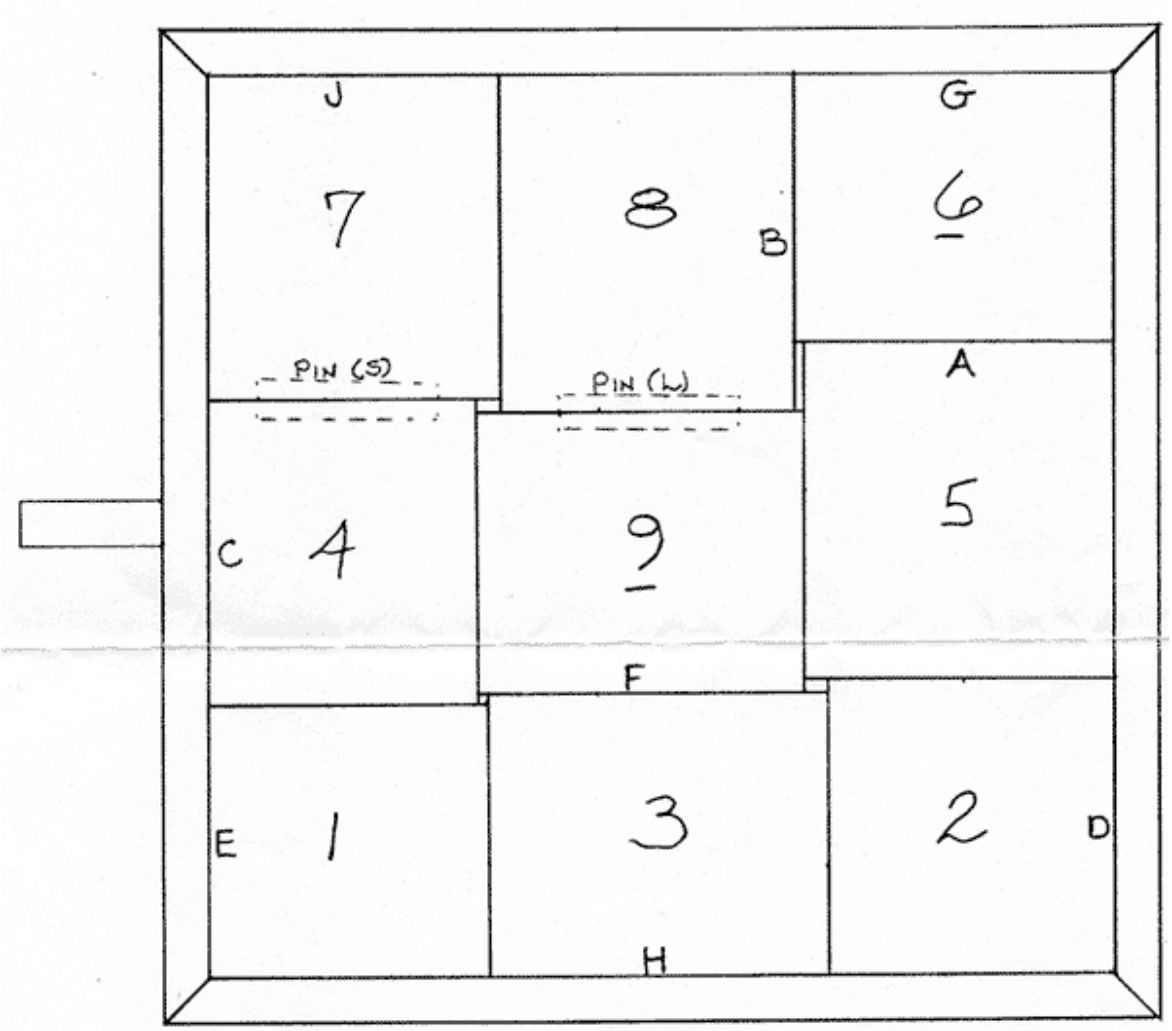
Pieces: Bocote; frame: Maple

Classification: Packing and sequential movement

Copyright © 2002 IPP Design Competition
All rights reserved.

5 Bundle of Wood

Puzzle Solution:



Lay the frame on its side as shown above.

Insert the lettered pieces at the locations 1 through 7 and in that order. As you insert each piece, orient it so the piece's letter designation is as shown for each piece above.

After inserting the 7th piece, turn the frame over. Put the pin in the top notch in piece 8 and insert piece 8 into its position. Tilt the frame so the pin slides into the start (S) location between pieces 4 & 7. Now insert piece 9, turn the frame so the handle is on top. Shake the puzzle until the pin drops into the locked (L) position between pieces 8 & 9.

Copyright © 2002 IPP Design Competition
All rights reserved.

6 Can

Puzzle Goal:

Open the can.

Materials:

cherry tree, walnut, etc.

Classification: Take apart

Copyright © 2002 IPP Design Competition
All rights reserved.

6 Can

Puzzle Solution:

Crush the can like Popeye opening his spinach can, pressing 2 points on opposite edges of the label.

Copyright © 2002 IPP Design Competition
All rights reserved.

7 Castle Money-Box Mk. 2

Puzzle Goal:

Use the free coin to release the coin inside.

Materials:

African blackwood

Classification: Take-apart Puzzle

Notes:

Care should be take when screwing and unscrewing any wooden threads.

Copyright © 2002 IPP Design Competition
All rights reserved.

7 Castle Money-Box Mk. 2

Puzzle Solution:

The slotted lid is made up of two counter-rotating disks, the lower screwed in clockwise, and the upper counter-clockwise, and adjusted so that the slots in each are aligned. Any attempt to unscrew them together in either direction will therefore loosen one but tighten the other, making it impossible for the lid to be removed as one piece. The solution, therefore, is to insert the coin just far enough to unscrew the upper disk clockwise and the second disk can then be removed in the normal way to release the coin.

To reassemble, reverse this procedure, making sure the disks are screwed back in the *right order* and the *right way up*. A little practice may be necessary to ensure that the slots are aligned without either of the disks being under- or over-tightened.

Copyright © 2002 IPP Design Competition
All rights reserved.

8 Chequered Board Burr

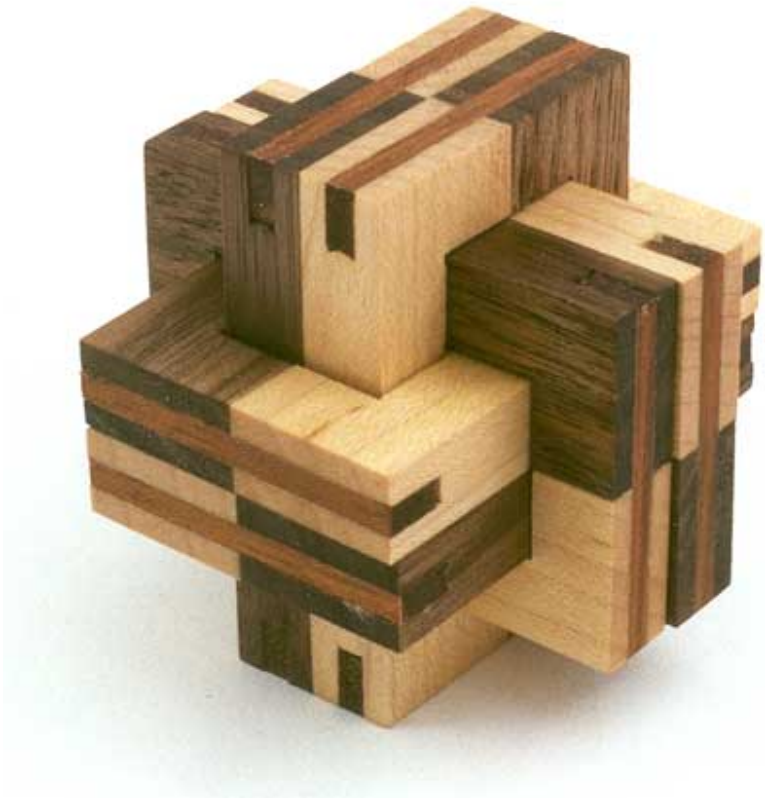
Puzzle Goal:

Assemble the six pieces into a three dimensional cross. Find both solutions. Rotation of the pieces is neither necessary nor allowed.

Materials:

Wood, Walnut (dark wood), Hard Maple (light wood), decorative splines from Jatoba (aka Brazilian Cherry)

Classification: 3.4 Burrs



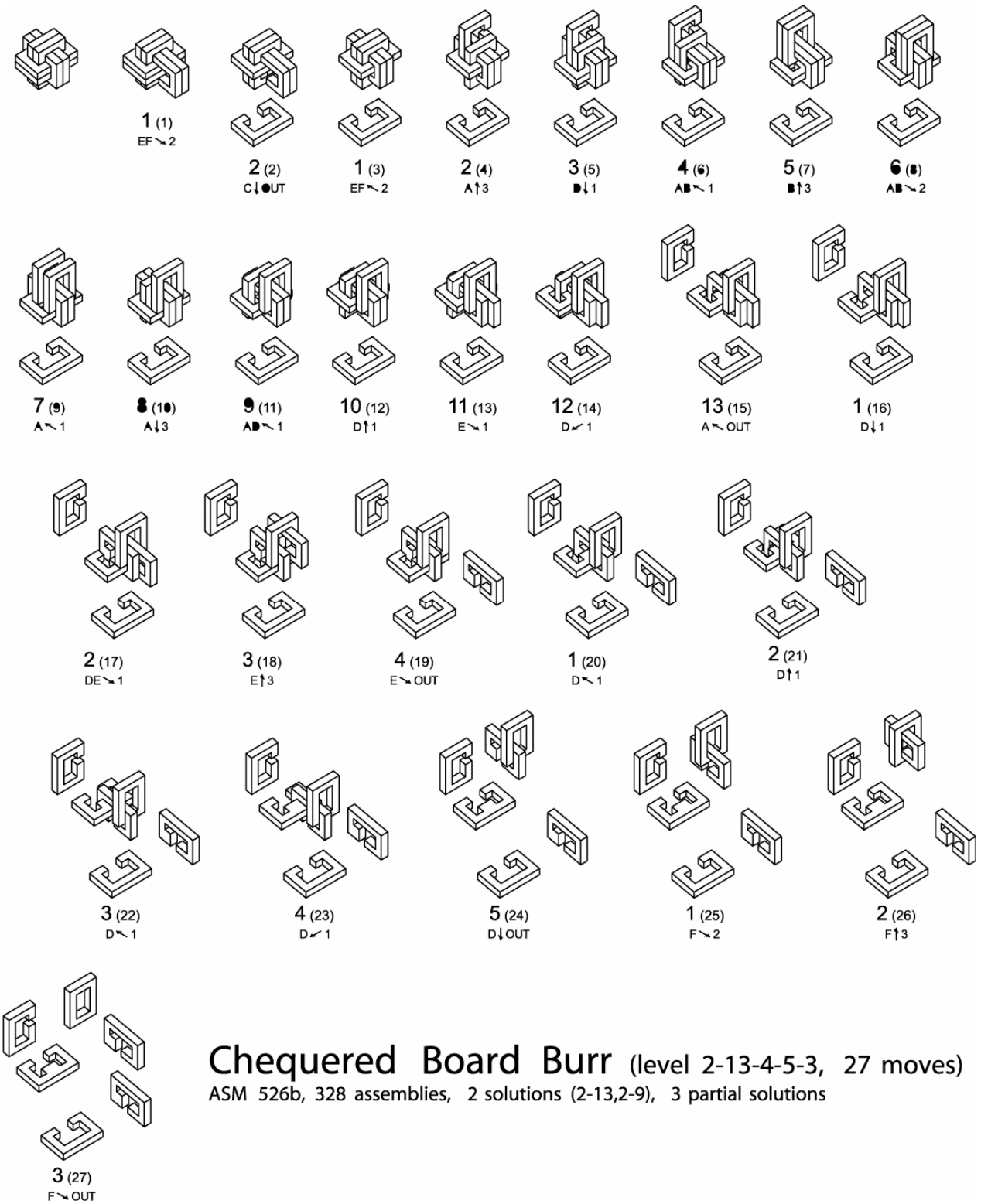
History:

This puzzle is one of the products of an extensive research, calculating all six board burrs. This is one of four of the most interesting designs. A booklet reporting on the research is planned.

Copyright © 2002 IPP Design Competition
All rights reserved.

8 Chequered Board Burr

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

9

Chromation

Puzzle Goal:

The 10 Chromation pieces create 10 distinct 9 piece puzzle sets. The primary goal of each of these puzzles is to construct a 3 by 3 by 3 cube, with each face a solid color having 2 adjacent faces of each of the 3 colors.

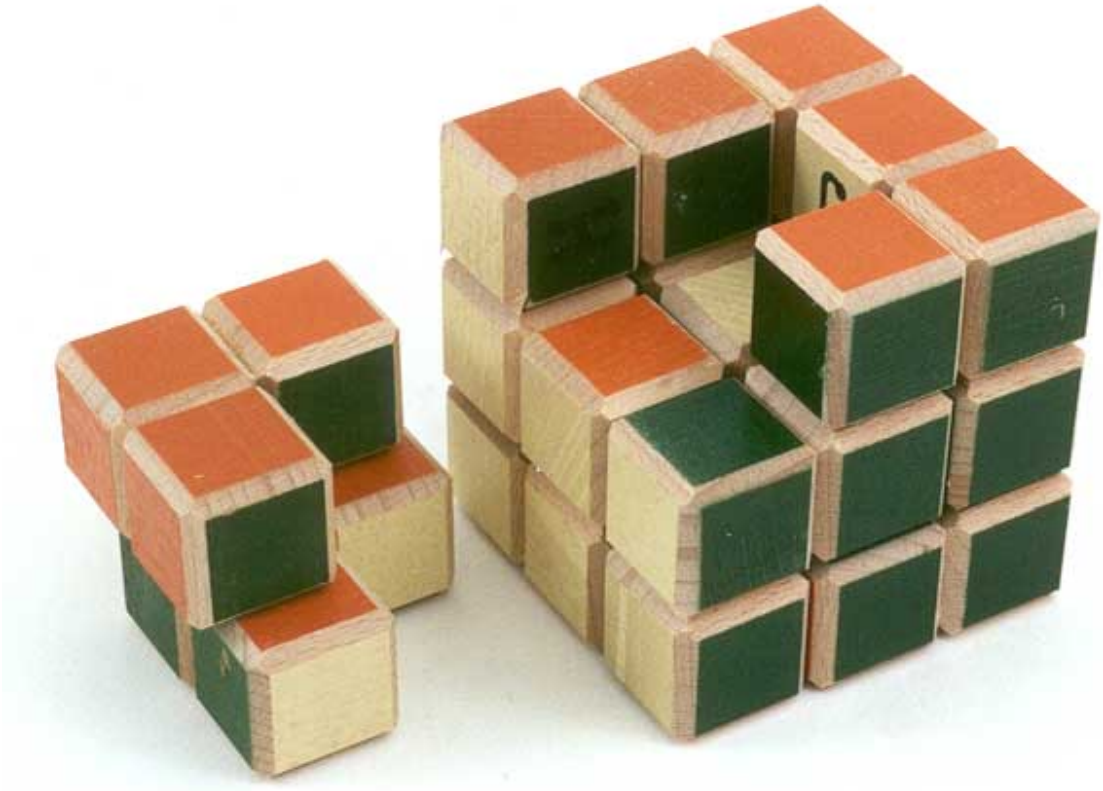
Materials:

Maple

Classification: Put-together

Notes:

8 of these have exactly 1 solution, 1 has 2 solutions and 1 contains 1 solution each to the 2 mirror primary problems. If you remove the matching adjacent faces constraint, there are over 40 secondary problems to the 10 puzzles, each with 6 solid color faces on the cube. (As a side note, each of the pieces is colored such that it has 2 adjacent faces of each of the 3 colors.) Each of the primary and secondary problems is a quite difficult puzzle in its own right.



Copyright © 2002 IPP Design Competition
All rights reserved.

9 Chromation

Puzzle Solution:

Example solution:

F F I	G F J	G G J
E I I	E E J	B H H
D D C	D C C	B B H

Copyright © 2002 IPP Design Competition
All rights reserved.

10

Cityscape

Puzzle Goal:

Arrange the buildings to get the right skyline. The skyline is correct when you can see horizontally from each of the 4 sides as much buildings as indicated on the city map.

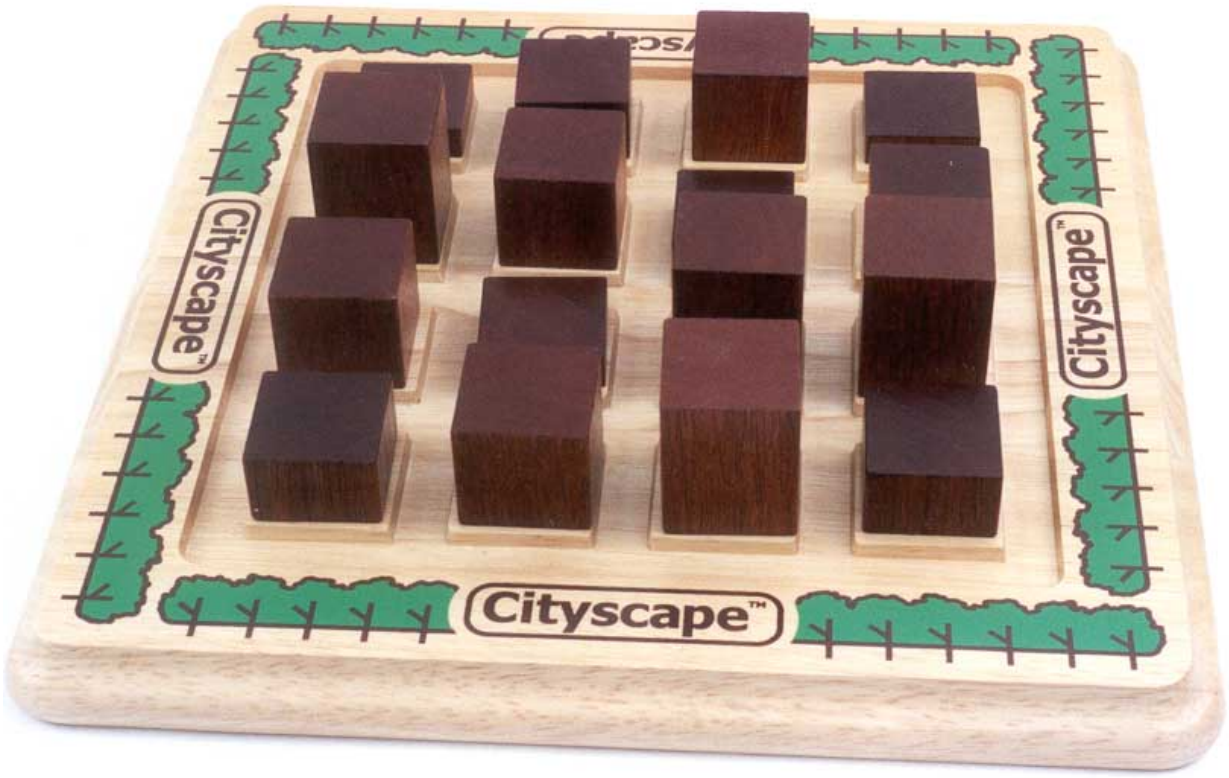
Materials:

Rubber wood

Classification: put together

Notes:

See booklet for a selection of separate challenges.



Copyright © 2002 IPP Design Competition
All rights reserved.

10 Cityscape

Puzzle Solution:

See the puzzle booklet in the box.

Copyright © 2002 IPP Design Competition
All rights reserved.

11 Collective

Puzzle Goal:

The puzzle is to take the Collective apart and reassemble it.

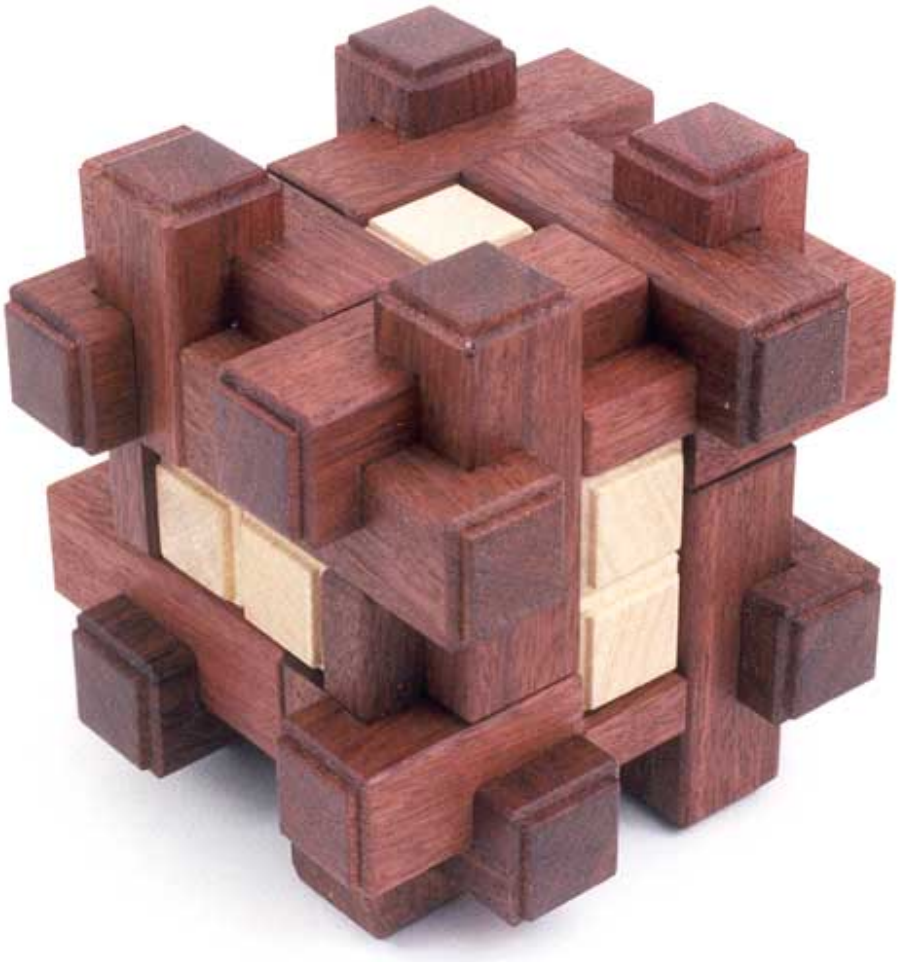
Materials:

Center burr: Queensland Silver Ash; Outer burr: Western Australian Jarrah

Classification: Interlocking

Notes:

Unlike normal framed burrs the five piece burr encased in the twenty-four piece frame work as one in this puzzle.

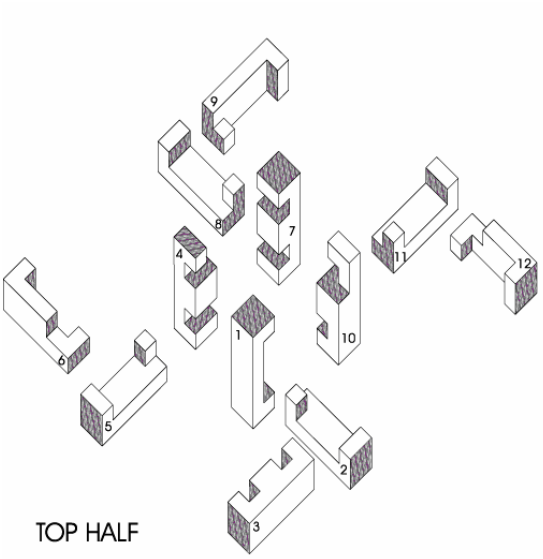


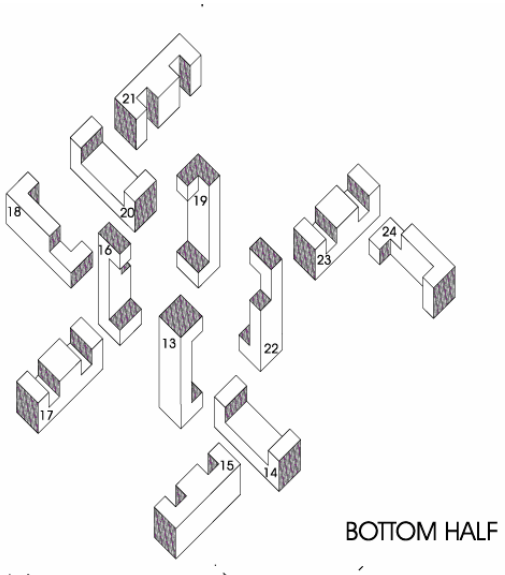
History:

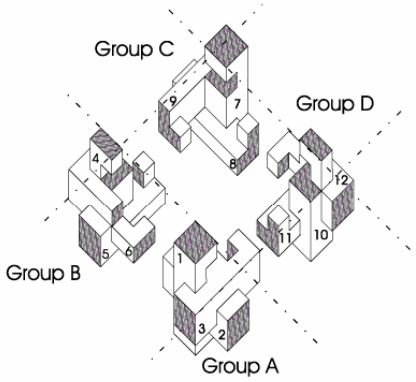
Copyright © 2002 IPP Design Competition
All rights reserved.

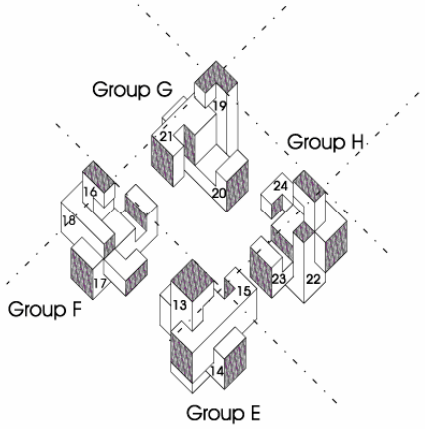
11 Collective

Puzzle Solution:









Assemble groups A & B, then join A & B together by interlocking blocks 2 & 6.
Assemble group C then lock it into group B interlocking blocks 5 & 9.
Place blocks 10 & 11 together then interlock block 11 into block 3, then slip block 12 down interlocking to block 8.
We will call this the TOP half of The Collective.

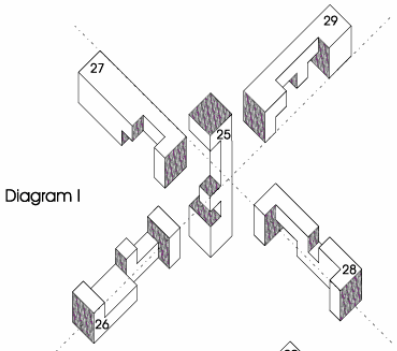
Assemble groups E & F, the join E & F together by interlocking blocks 14 & 18.
Assemble group G then lock it into group F interlocking blocks 17 & 21.
Place blocks 22 & 23 together then interlock block 23 into block 15, then slip block 24 down interlocking to block 20.
We will call this the BOTTOM half of The Collective.

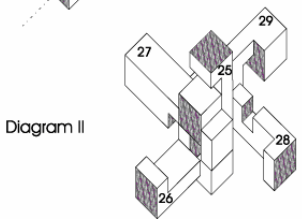
Assemble the five piece burr at the centre of The Collective inside the BOTTOM half of the puzzle by putting the blocks in in order 25 through 29 as shown in Diagram I.

Note: when placing the first one - block 25 - ensure that the bottom face of this block is not pushed right through to your work surface. The bottom face should be flush with the underside of blocks14, 17, 20 & 23.

The blocks should now look like Diagram II but inside the BOTTOM half of The Collective.

Now push block 25 down through the puzzle 10mm - it should go all the way to your work surface.
Then pull block 27 and 29 at the same time to the left so that block 29 interlocks over block 19.





Now comes the REALLY tricky bit... !

Pick up the TOP half of The Collective and flip it upside down and turn on a 45o degree angle to the BOTTOM half.

Lower it down over the BOTTOM half with block 4 behind block 27 and block 9 laying across the top of it.

Gently twist the TOP half clockwise while making sure that each of the corner vertical pieces lock together (one each from the TOP and BOTTOM halves) and at the same time pushing blocks 27 & 29 to the right to their original positions as in Diagram II.

When the two halves of The Collective are squarely locked together:
Push block 25 up 10mm
then block 26 away from you 20mm
then block 28 to left 30mm
then block 29 towards you 20mm
then block 28 to right 10mm
and finally block 27 to right 20mm.

Copyright © 2002 IPP Design Competition
All rights reserved.

12 Corner Cube

Puzzle Goal:

Disassemble and then reassemble the cube.

Materials:

center: Bolivian rosewood; middle: marbled macassar ebony; corner: cocobolo, Mexican kingwood, and bocote.

Classification: Interlocking

History:

The standard Second Stellation design begins with a cluster of six sided center blocks, upon which are glued triangular prism blocks to both ends. It doesn't matter whether the prisms are right or left handed as long as they are all the same. At this point, it is a Four Corners puzzle (Stewart Coffin design number 6) adding rhombic pyramid blocks next to the prism blocks turns the puzzle into Nova (Stewart Coffin design number 8) which is a symmetrical version of the 14-a Second Stellation puzzle that I originally tried this with. The trick to my modified Second Stellation is a base of three left handed zig-zags, and three right handed ones. From there I build all six pieces up the same, but three of them are mirror image of the other three.

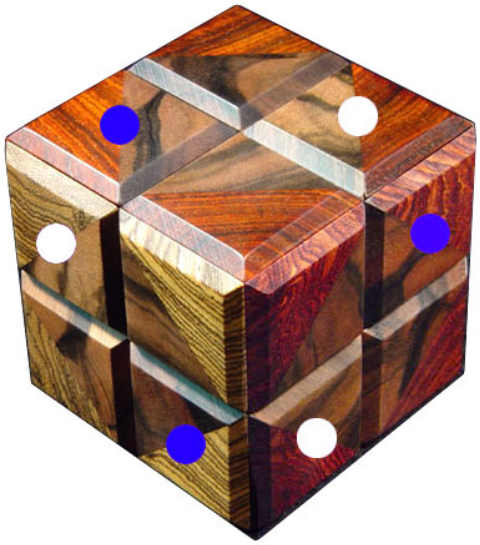
Once again, the shape of this puzzle is simply a Second Stellation of the rhombic dodecahedron with the hexagonal dimples filled in -- these dimples can be filled in either with three rhombic pyramid blocks, or with two prism blocks, one right handed, and one left handed. I call the shape of this new puzzle Crowded Cluster because it appears to be a cluster of 8 rhombic dodecahedrons, however they intersect each other, which is why the cluster is 'crowded'.

Corner Cube is the truncated version of Crowded Cluster.

Copyright © 2002 IPP Design Competition
All rights reserved.

12 Corner Cube

Puzzle Solution:



This is a variation of a 6 piece Diagonal Burr. Two halves separate along one of the diagonal axes of the puzzle. There are several ways to manipulate the assembled puzzle with your hands to separate the halves, although some only work when the puzzle fits loosely. The method that I will describe here involves pushing the two halves apart, so it should work regardless of how snugly the pieces fit together. The cluster of pieces will only disassemble on one of the four internal axes, so you must locate that axis by trial and error. For each axis, there is one way to push that will separate the halves, and one way to push that will hold them tightly together. In this sense, the Corner Cube is very much like the Pennyhedron (Stewart Coffin design #52)

Notice that each face of the puzzle has two grooves in it. Each hand will manipulate three faces of the cube, and all three faces should share the common corner that represents the internal diagonal axis of the puzzle. Place three fingers in each hand in the intersection of the grooves on the faces

If you rotate the puzzle clockwise, your fingers will touch the blue dots on the picture. If you rotate the puzzle counter clockwise, your fingers will touch the white dots. The key here is that you are rotating the puzzle, and not your hands. By rotating the puzzle, you will touch white dots with one hand and blue dots with the other.

So, try all four axes, rotating the puzzle both clockwise, and counter clockwise. Eventually you will stumble across the solution.

Copyright © 2002 IPP Design Competition
All rights reserved.

13 Cube Brick

Puzzle Goal:

Match the tops of the 15 cubes by color in 3x5 tray.

Build other shapes (in booklet) color-matched on top only.

Form 3-D shapes with non-matched colors on all joined edges.

Materials:

Laminated faces on cubes; deluxe wood box

Classification: 3D Edge-matching

Notes:

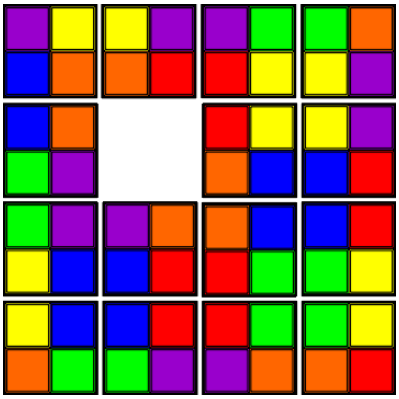
Each cube represents a selection of four colors from the set of six (15 combinations). Additionally, each is a corner-cube with identical colors on opposite corners. The result is that the six faces of each cube contain each of the six ways to orient four colors in a 2x2 pattern. So when solving a 2-D edge matching puzzle and when you want a certain combination of colors but only have it in the wrong orientation, with this set it will always be there!

Copyright © 2002 IPP Design Competition
All rights reserved.

13 Cube Brick

Puzzle Solution:

Example 4x4 (with hole) configuration:



Copyright © 2002 IPP Design Competition
All rights reserved.

14 Cube-like Puzzle Ring

Puzzle Goal:

Assemble a puzzle ring from the 13 pieces

Materials:

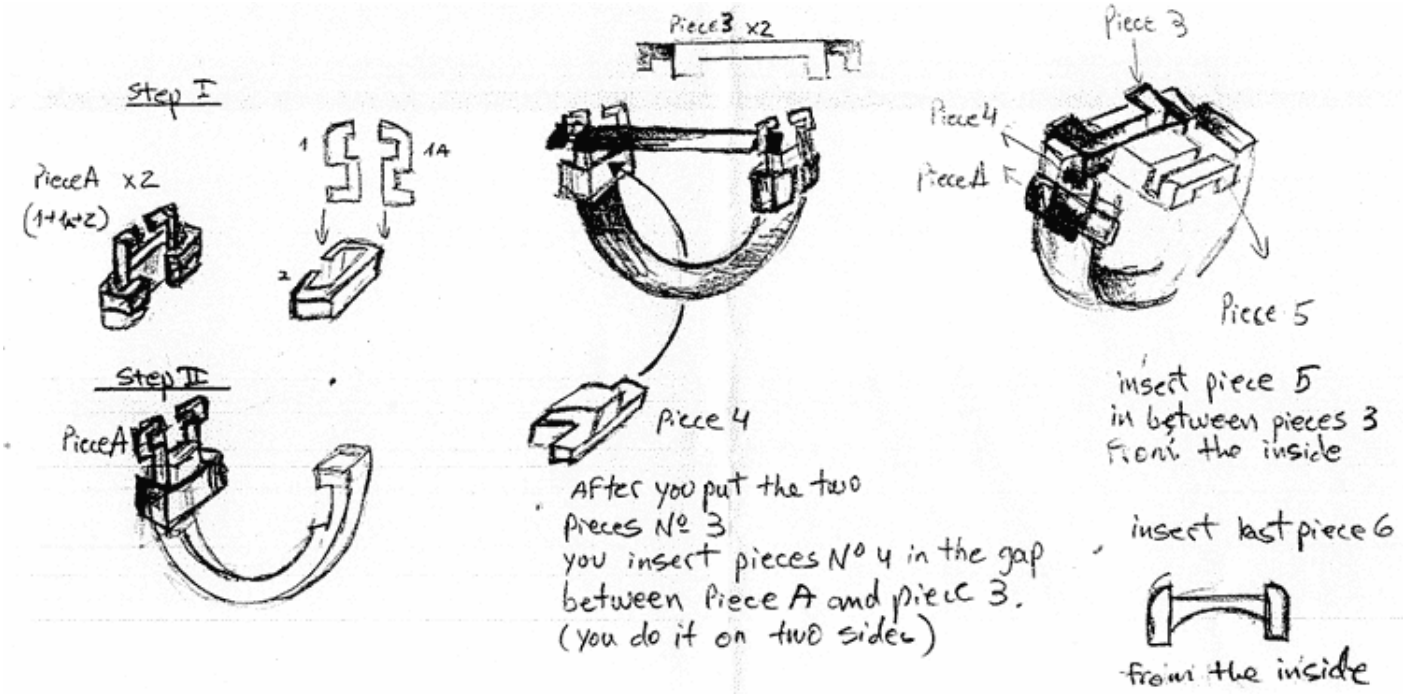
Sterling silver

Classification: Put together

Copyright © 2002 IPP Design Competition
All rights reserved.

14 Cube-like Puzzle Ring

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

15 Cubes

Puzzle Goal:

At the start, you should only see the color blue on the outside. Move the little cubies within the cage so that you only see orange.

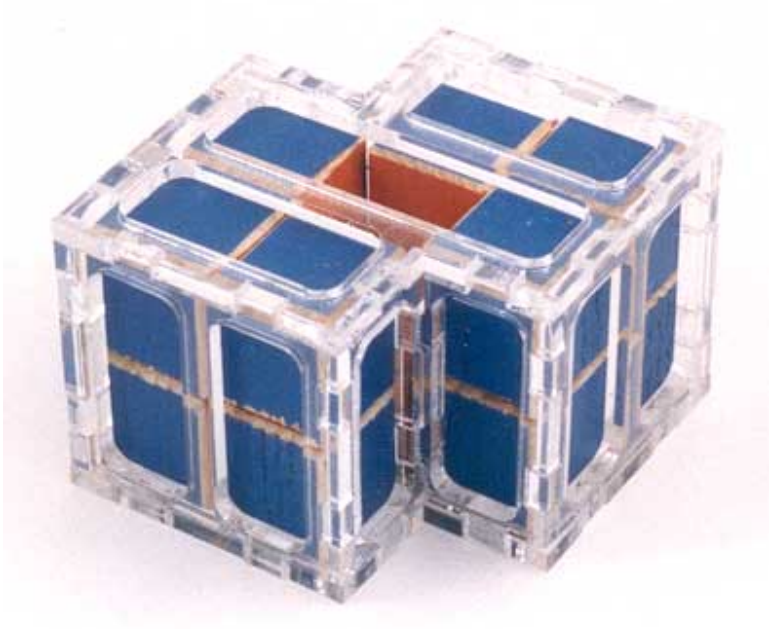
Materials:

Wood, plastic, paint

Classification: Sequential Movement

Notes:

Inspiration for the puzzle: Inversion, Magic Jack and Rubik's Siamese Cubes.



Copyright © 2002 IPP Design Competition
All rights reserved.

15 Cubes

Puzzle Solution:

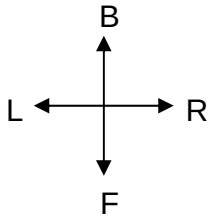
Start:

Top

	e	f
c		d
a	b	

Bottom

	l	m
i	j	k
g	h	



b-B, a-R, g-U, h-L, j-F, b-D, a-B, g-R, h-U, i-F,

b-L, k-L, m-F, f-D, d-B, a-R, k-U, m-L, f-F, d-D,

e-R, k-B, g-B, j-U, m-F, l-F, d-L, e-D, a-B, g-R,

l-U, f-L, e-F, a-D, g-B, l-R, c-R, h-B, i-U, m-L,

f-F, c-D, j-B, i-R, m-U, f-L, c-F.

Finish:

	k	g
h	j	l
m	i	

	d	a
b		e
f	c	

Copyright © 2002 IPP Design Competition
All rights reserved.

16 Diamont

Puzzle Goal:

Assemble and disassemble the pieces.

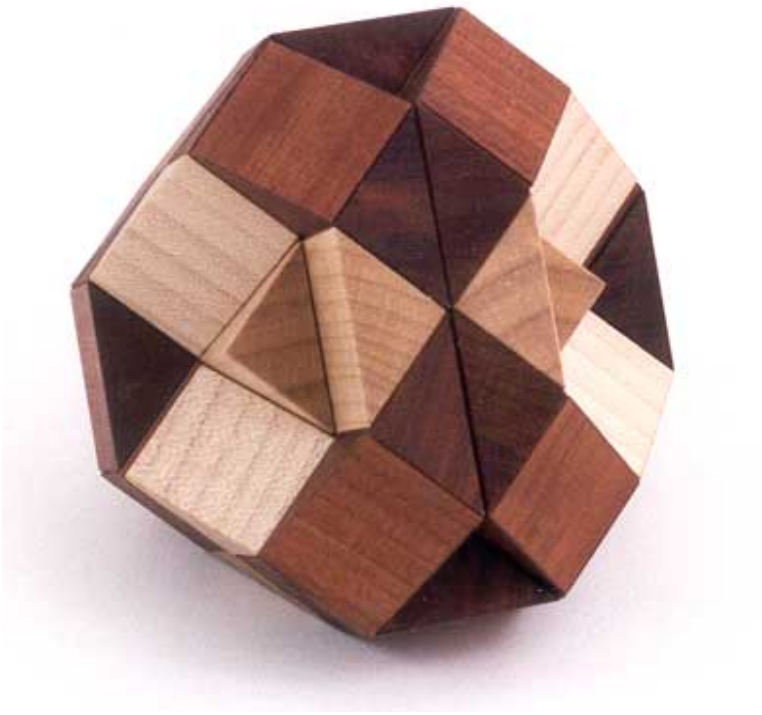
Materials:

plum-tree and maple

Classification: Put Together

Notes:

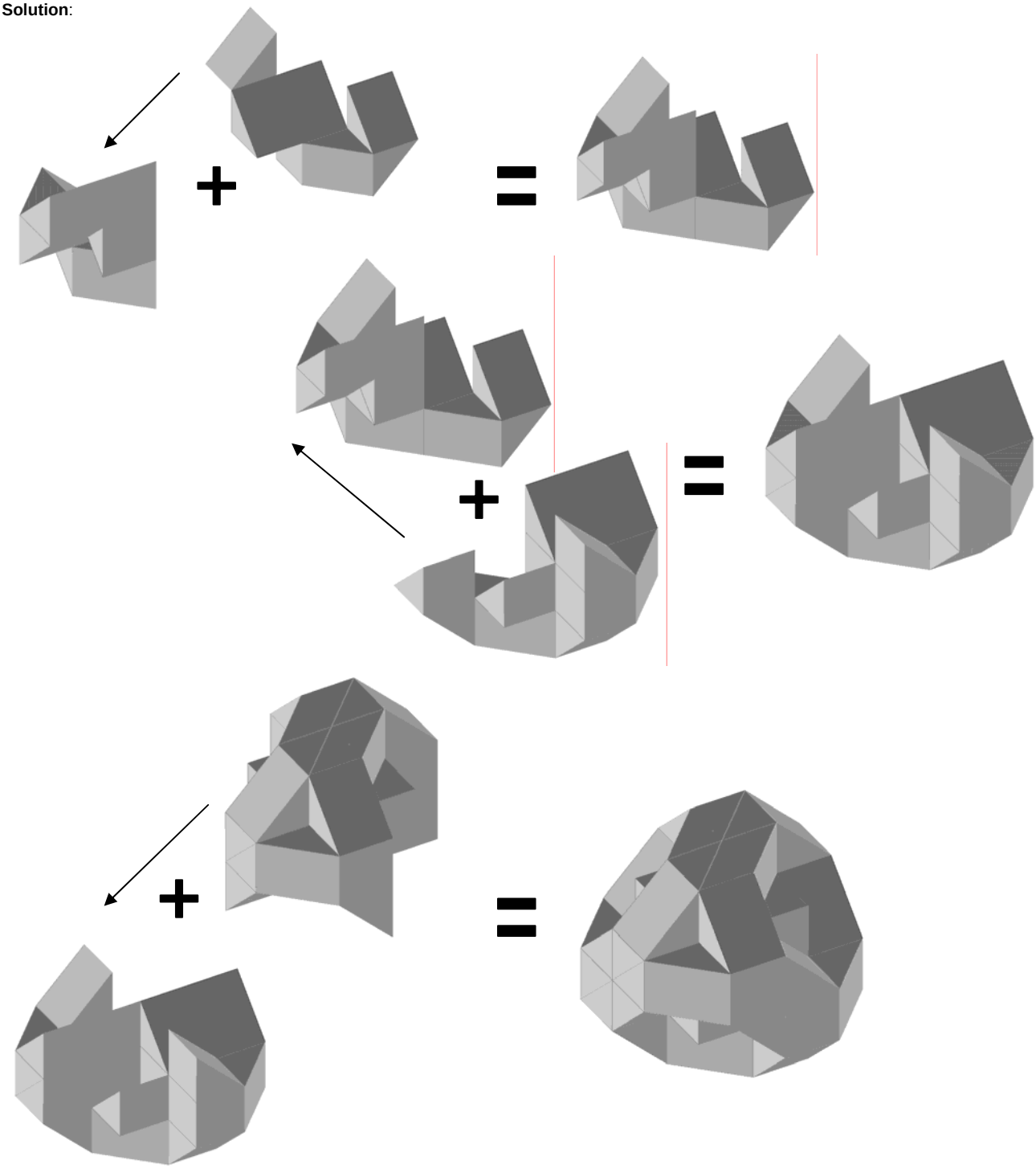
Interesting form of brain-teaser, created from basic elements - diagonal cube halves. The brain-teaser is created in simple space of cube 4x4x4. Only if we take away several elements on opposite corners of these cube 4x4x4 than arise interesting regular form. Space of a cube 4x4x4 has six regular sides, but at this brain-teaser there is perceptible four regular and symmetrical sides. Every one side contains regular hexagon.



Copyright © 2002 IPP Design Competition
All rights reserved.

16 Diamont

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

17 DoveTail Bar Puzzle

Puzzle Goal:

Open the "box", by removing the top; in other words: "taking a bite of the bar!"

Materials:

Walnut and maple woods

Classification: Secret Opening, Take-Apart

Notes:

This was inspired by the familiar Popsicle stick ice cream bars, and specifically the Dove Bar Ice Cream, with the thought that a puzzle that resembles a known or familiar shape is more attractive and inviting of attention and interest. The walnut wood used is obviously indicative of the Dark Chocolate flavor.

Copyright © 2002 IPP Design Competition
All rights reserved.

17 DoveTail Bar Puzzle

Puzzle Solution:

Turn the stick around and insert the square end. At the end of the hole there is a spring loaded button--press it with the stick until the end of the ice cream bar is released and can be twisted off.

Copyright © 2002 IPP Design Competition
All rights reserved.

18 Edge-Corner-Cube

Puzzle Goal:

Assemble the six puzzle-pieces to a 3x3x3 cube.

Materials:

Beech; stainless steel wires (1.5mm and 2.0mm)

Classification: interlocking

Notes:

While writing a computer program which should be able to solve packing puzzles of different kind, most of the time you have to deal with exceptions. It is not the regular case you have to care, but all these tricky cases you have to pay attention to. By writing I thought about the fact that most of the puzzles made of cubes consist of pieces of cubes which have been glued together by touching one side of a cube with another side of an other cube. Having realized this obvious fact it is clear how to go on: I extended my program to be able to connect cubes in the following three ways: side by side (6 directions), edge by edge (12 directions), corner by corner (8 directions). And by using all these three kinds of linkages I came up with a design of a 3x3x3 interlocking cube which consists of six pieces.

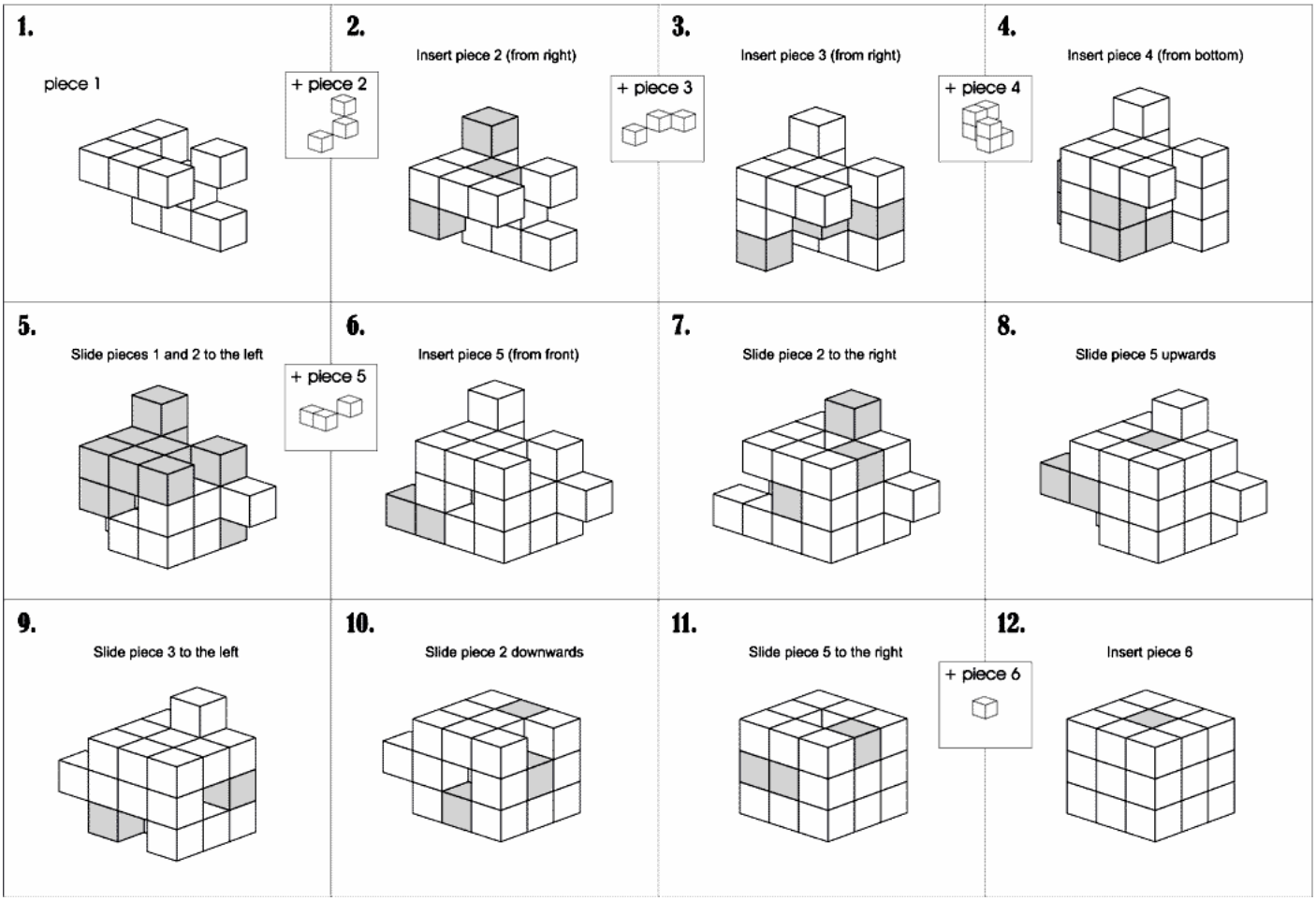
The puzzle has been designed only by using paper and pencil and with a vague idea of the pieces to interlock. After having finished with this it has been clarified by using this program that there is only one solution.

Having done the theoretical work there has to be constructed a physical model. While using the linkages "edge by edge" and "corner by corner" all edges of every little cube has to be beveled. Apart from removing the 1x1x1 little cube at the beginning it takes 6 moves to remove the first piece.

Copyright © 2002 IPP Design Competition
All rights reserved.

18 Edge-Corner-Cube

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

19

Four Triangles

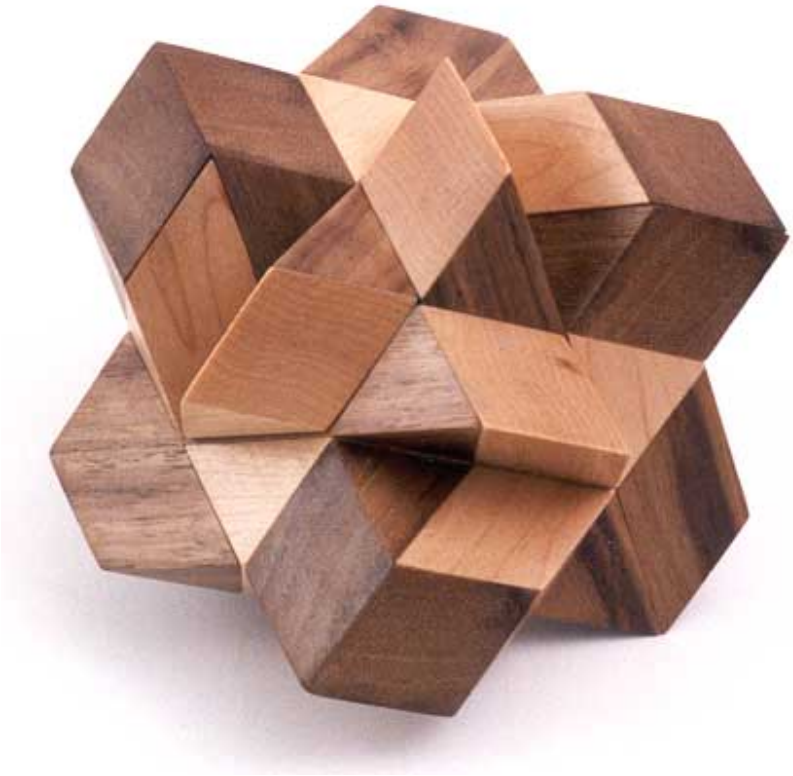
Puzzle Goal:

Six dissimilar pieces join together to form four triangles.

Materials:

Hard maple and black walnut

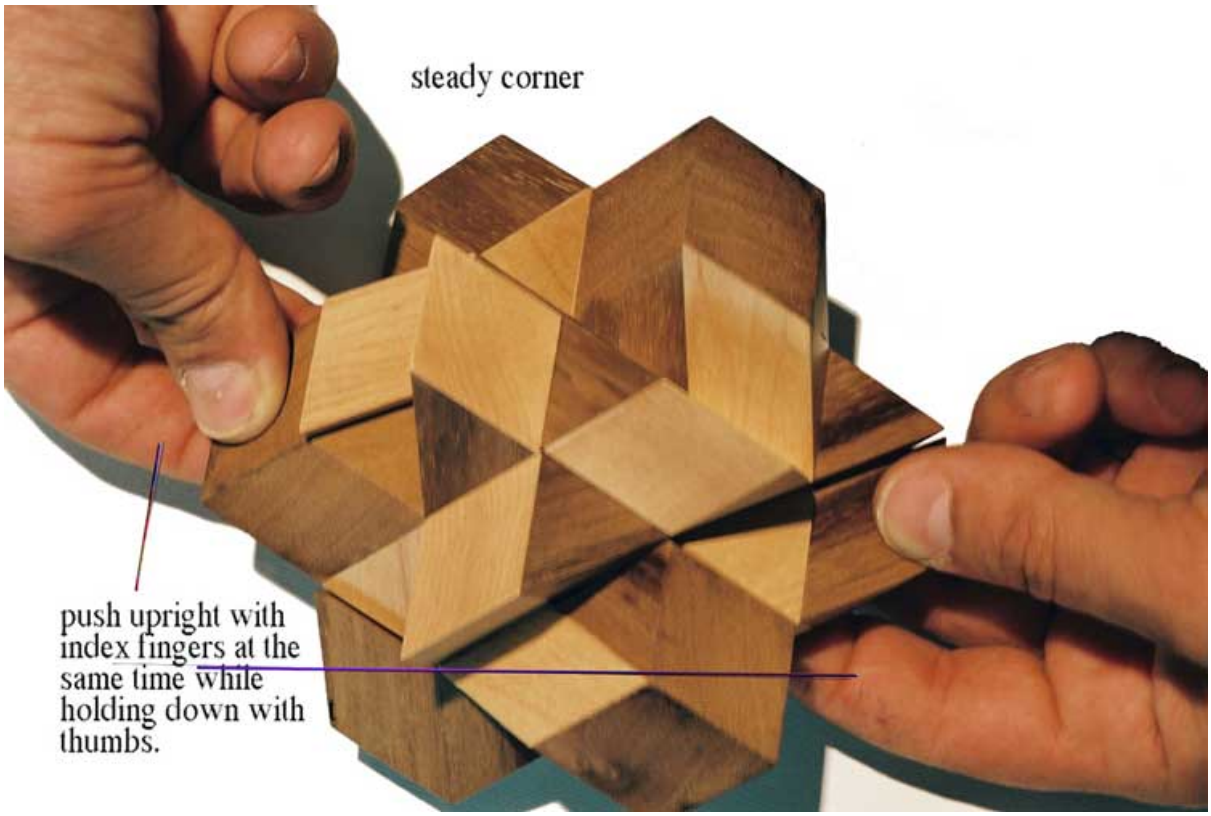
Classification: Interlocking



Copyright © 2002 IPP Design Competition
All rights reserved.

19 Four Triangles

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

20 Gold-Silver-Bronze

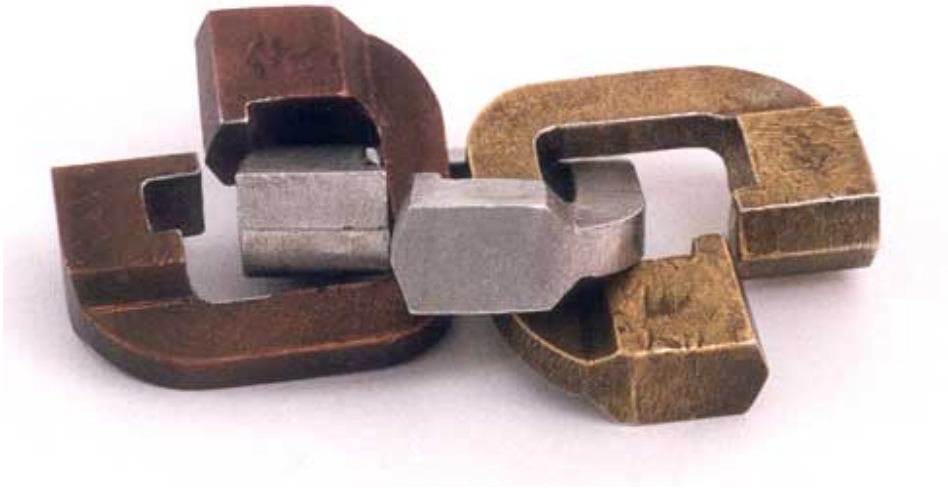
Puzzle Goal:

Take the three rings apart. Then put them back together again in the order Gold-Silver-Bronze

Materials:

Cast tin, galvanized with gold and copper

Classification: Take-apart



Notes:

More than 5 years ago, I had the crazy idea of a special three-piece chain. It should be possible to interchange the order of the links, but the chain could not be taken apart. I found a working design after several hundred hours of searching and making over twenty prototypes of cardboard, plastic, led and tin. By making notches in two pieces, the chain could be taken apart. However, you should first bring the links in the right order.

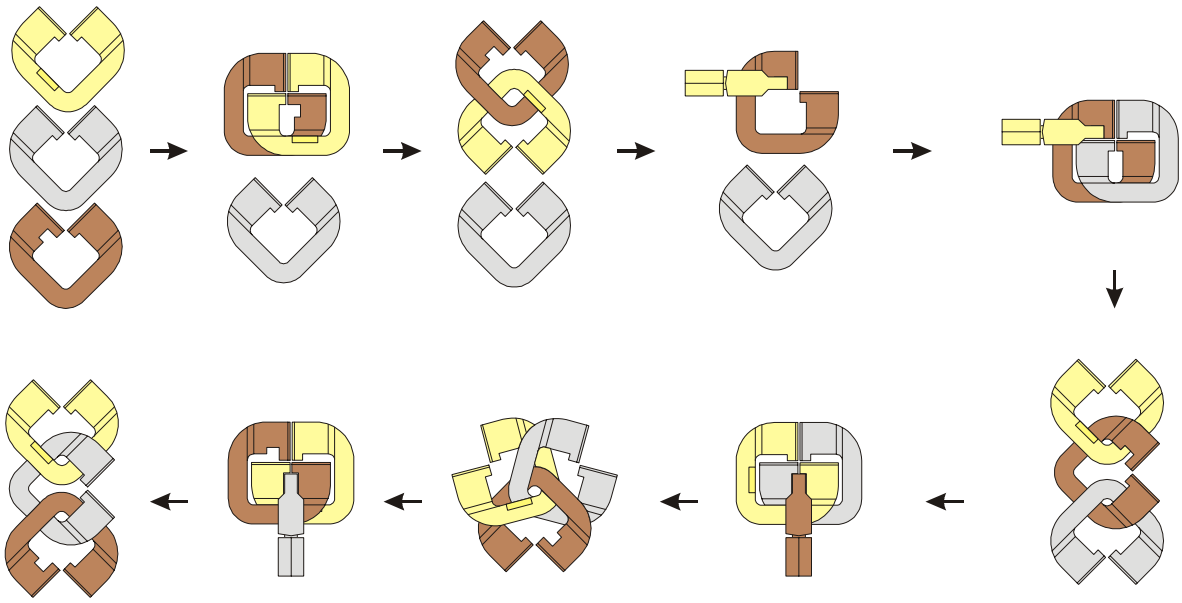
I also designed a more difficult version of this puzzle. Topologically, there are no less than 24 ways of having three links in a row, and 16 ways of having the three links through each other. By modifying the exact shapes of the links, I turned the puzzle effectively into a mechanical maze. You have to find your way through the 24+16=40 states of the puzzle in order to take it apart.

Copyright © 2002 IPP Design Competition
All rights reserved.

20 Gold-Silver-Bronze

Puzzle Solution:

Starting with the three links separated, first put together the gold and the bronze link. There are two ways of doing this. Only one way is correct, see drawings. Then put the notch of the gold link into the notch of the bronze link. Next put the silver link through the bronze link. The result is a chain with links in the order gold-bronze-silver. Finally, change the order of the rings into gold-silver-bronze.



Copyright © 2002 IPP Design Competition
All rights reserved.

21 Holey Box Packing Puzzle

Puzzle Goal:

Pack all 12 identical pieces into the box through the square hole in the top.

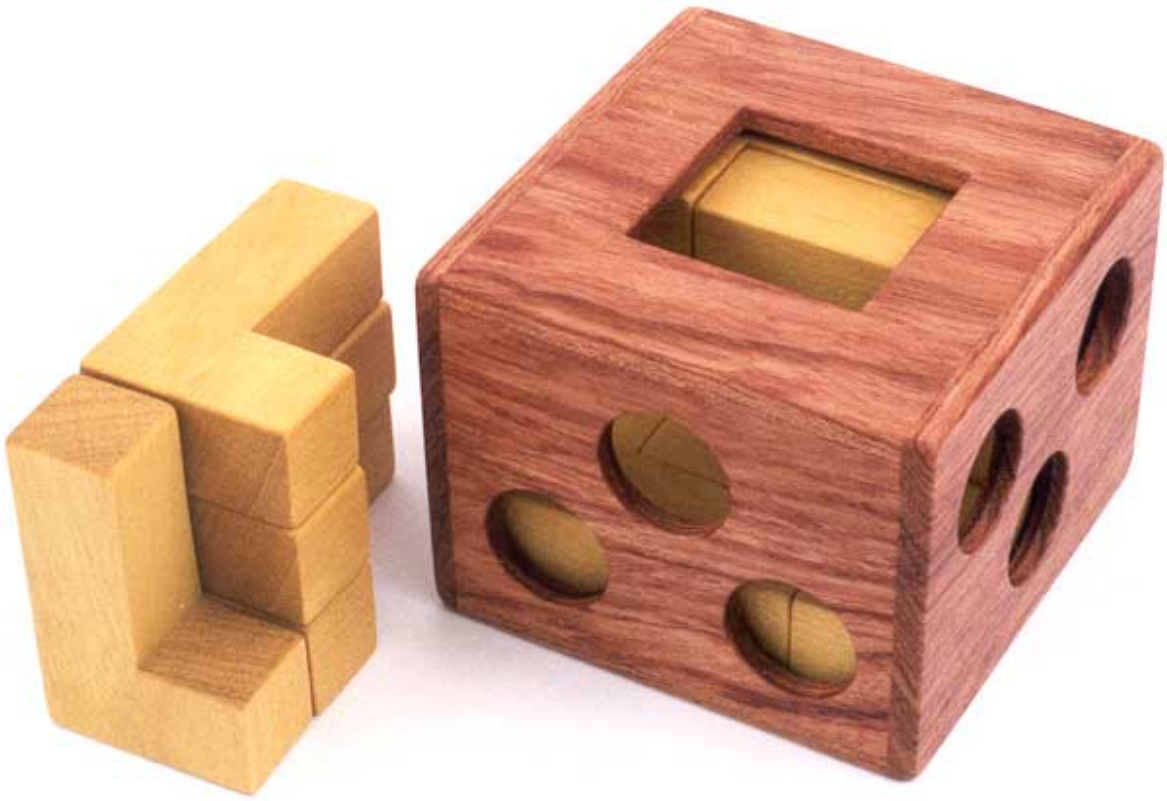
Materials:

Box: African Bubinga; Pieces: Brazilian Satinwood

Classification: Put together, box packing

Notes:

The 12 identical pieces can only enter the box through the (square) hole. The other holes in the box are not only for making it possible to have more looks into the inside but are also needed to manipulate the pieces to make the necessary moves, twists and rotations.



Copyright © 2002 IPP Design Competition
All rights reserved.

21 Holey Box Packing Puzzle

Puzzle Solution:

Three example solutions. The letters indicate the order in which the pieces are inserted into the box.

```
  TOP     L-1     L-2     L-3    BOTTOM

######  ######  ######  ######  ######
######  #EJJI#  #ECJI#  #EEJI#  ######
##  ##  #FLLD#  #FCLD#  #FFLI#  ######
##  ##  #HHKD#  #HCKB#  #HCKA#  ######
######  #GGKD#  #GBBB#  #GAAA#  ######
######  ######  ######  ######  ######


######  ######  ######  ######  ######
######  #GDDD#  #GDBB#  #GGAA#  ######
##  ##  #JLKK#  #JLKB#  #JLKA#  ######
##  ##  #JLIH#  #CCCB#  #EFCA#  ######
######  #EFIH#  #EFIH#  #EFIH#  ######
######  ######  ######  ######  ######


######  ######  ######  ######  ######
######  #DGGG#  #DFFF#  #DEEE#  ######
##  ##  #DLLG#  #CCLF#  #BBLE#  ######
##  ##  #HIKJ#  #CIKJ#  #BIKJ#  ######
######  #HHHA#  #CAAA#  #BIKJ#  ######
######  ######  ######  ######  ######
```

Copyright © 2002 IPP Design Competition
All rights reserved.

22 IPP Slide

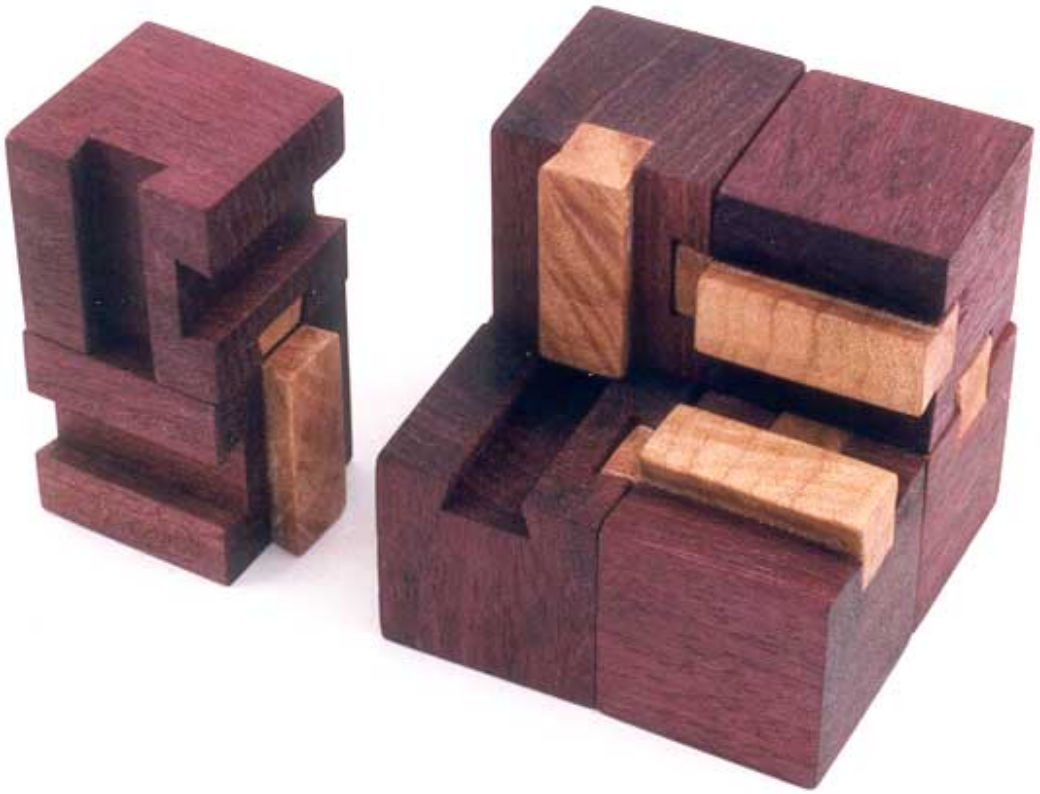
Puzzle Goal:

Assemble the 8 pieces into a 2x2x2 cube.

Materials:

Purpleheart/Redheart w/Myrtlewood dovetails

Classification: Put Together



Copyright © 2002 IPP Design Competition
All rights reserved.

22 IPP Slide

Puzzle Solution:

1.Assemble pieces 5, 7, 8 into an ‘L’ shape.

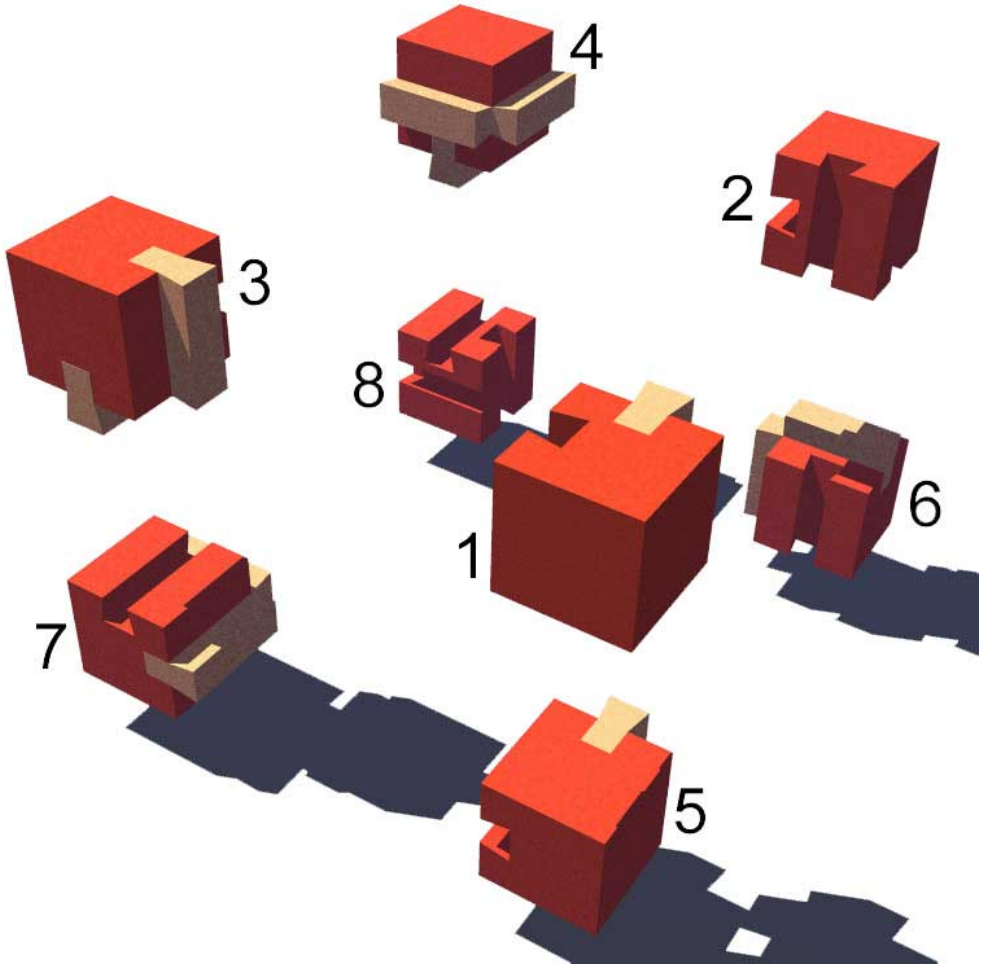
2.Slide piece 6 into the ‘L’. Now you should have the bottom half of the cube.

3.Slide piece 2 onto piece 6.

4.Slide pieces 4 and 3 together to make a 2x1 unit.

5.Slide the unit onto pieces 7 and 8, going from 7 towards 8.

6.Slide piece 1 in to complete the cube.



Copyright © 2002 IPP Design Competition
All rights reserved.

23

IPP22 Puzzle

Puzzle Goal:

Arrange the 16 pieces (tetriamonds, pentiamonds, and selected hexiamonds) forming the IPP to make the 22. Now solve the IPP again. Other shapes can also be created.

Materials:

Lasercut acrylic in red, white, blue

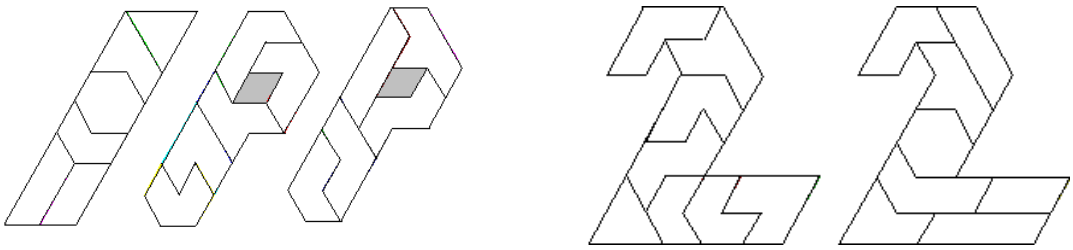
Classification: Put-together puzzle

Copyright © 2002 IPP Design Competition
All rights reserved.

23

IPP22 Puzzle

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

24

Jar Breaker

Puzzle Goal:

Help the chain gang "prisoner" break out of the bottle "jail"

Materials:

Mixed Media

Classification: Take-apart and dexterity

Copyright © 2002 IPP Design Competition
All rights reserved.

24 Jar Breaker

Puzzle Solution:

The prisoner (striped cylinder) comes apart just above the horizontal black stripe that marks the prisoner's neck. This action opens up a gap which reduces the diameter of the prisoner's neck permitting the cylinder to slide past the black ball through the narrow neck of the jar. The prisoner is held together by a strong magnet. The link in the chain and the small ball hanging at the end of the chain inside the jar are red herrings. The best technique I have discovered to open up the gap at the prisoner's neck is as follows:

1) Make sure the cap on the jar is screwed all the way onto the jar, so that the prisoner and the ball and chain can move freely in the neck of the jar.
2) Turn the jar on its side and rotate it (around the axis of the neck of the jar) so that the prisoner lies on top of the ball which hangs in the middle of the chain at the neck of the jar.
3) Tilt the bottom of the jar up slightly and wiggle the jar so that the prisoner slides into the neck of the jar. Stop when the ball in the neck of the jar touches the prisoner at a point just above (1/32 " or so, "above" means toward the top of the prisoner's head) the horizontal black stripe which marks the prisoner's neck.
4) Unscrew the cap on the jar just enough to tighten the chain and hold the prisoner snugly in place, squeezed between the ball and the neck of the jar.
5) Turn the jar upright and rap the bottom of the jar smartly against the palm of your hand. The bottom part of the prisoner should slide down from the head, opening up a gap of about ½" of thinner rod at the prisoner's neck. (If the prisoner drops intact to the bottom of the jar, then you did not grip it snugly enough in step 4 above.) The ball should be very close to the edge of the gap opened up at the neck (less than 1/16"). If it is not, repeat steps 2-4 above.
6) This next part takes a bit of patience and practice. Carefully turn the jar back on its side and rotate it (about the axis of the neck of the jar) so that the prisoner rests on the bottom side of the jar and the ball rests on top of it. Tighten the cap a few turns back onto the jar until the ball releases its grip on the prisoner in the neck of the jar, being careful to keep the ball in its position next to the gap at the prisoner's neck. Hold the jar on its side with the top of the jar slightly lower than the bottom. Gently jiggle the ball attached on the end of the chain outside the cap of the jar with your finger until the ball inside the neck works it's way into the gap formed at the prisoner's neck. After this happens you are home free. Unscrew the cap and tilt the neck of the jar upwards to remove the chain. Then slide the prisoner out.

With practice, you can learn to free the prisoner with a single movement: Screw on the cap and position the prisoner with the ball at the neck as described above. Pull tightly on the ball at the cap with one finger while rapping the jar against the palm of your hand. The prisoner's neck pops open, the ball pops past the prisoner's head, and the prisoner's neck pops back together all in one quick move.

To put the prisoner back in the jar, I suggest the following technique:

1) Drop the chain into the jar until the ball at the middle of the chain is positioned in the neck of the jar just above the constriction at the neck (about 1 ½" from the jar top). Lay the jar on its side and hold the cap perpendicular to the jar opening, pressing it against the threads around the jar's mouth. This leaves the top of the jar open so you will be able to slide the prisoner inside.
2) Pull the body of the prisoner apart from the head to open up a gap of about 1 ½". Carefully slide the prisoner into the neck until the prisoner lies on top of the ball and the ball touches the narrow rod in the gap opened up at the prisoner's neck. If you have trouble sliding the prisoner past the ball then you did not position the ball correctly in step 1 above.
3) Place the cap on the jar threads and screw the cap all the way on. Slowly tilt the top of the jar upwards, letting the prisoner and chain slide together down into the jar. Once they are free of the neck of the jar, the prisoner's neck will close up again.

Copyright © 2002 IPP Design Competition
All rights reserved.

25

Jewelry Box

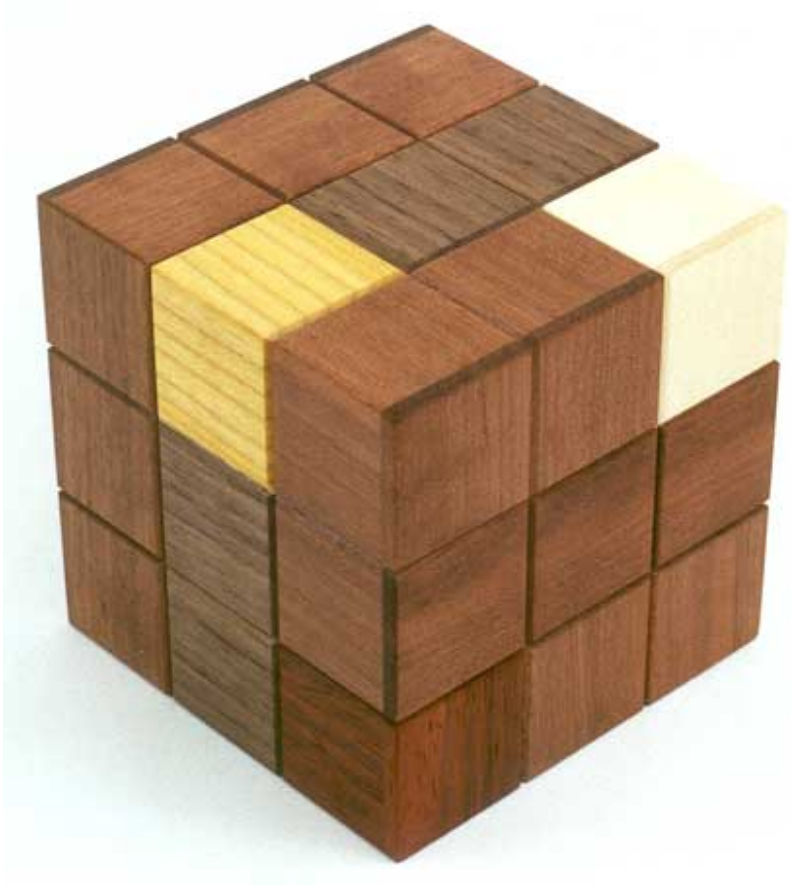
Puzzle Goal:

Find the hidden jewelry drawer

Materials:

walnut, mizuki, makore, padock, urushi

Classification: Take apart

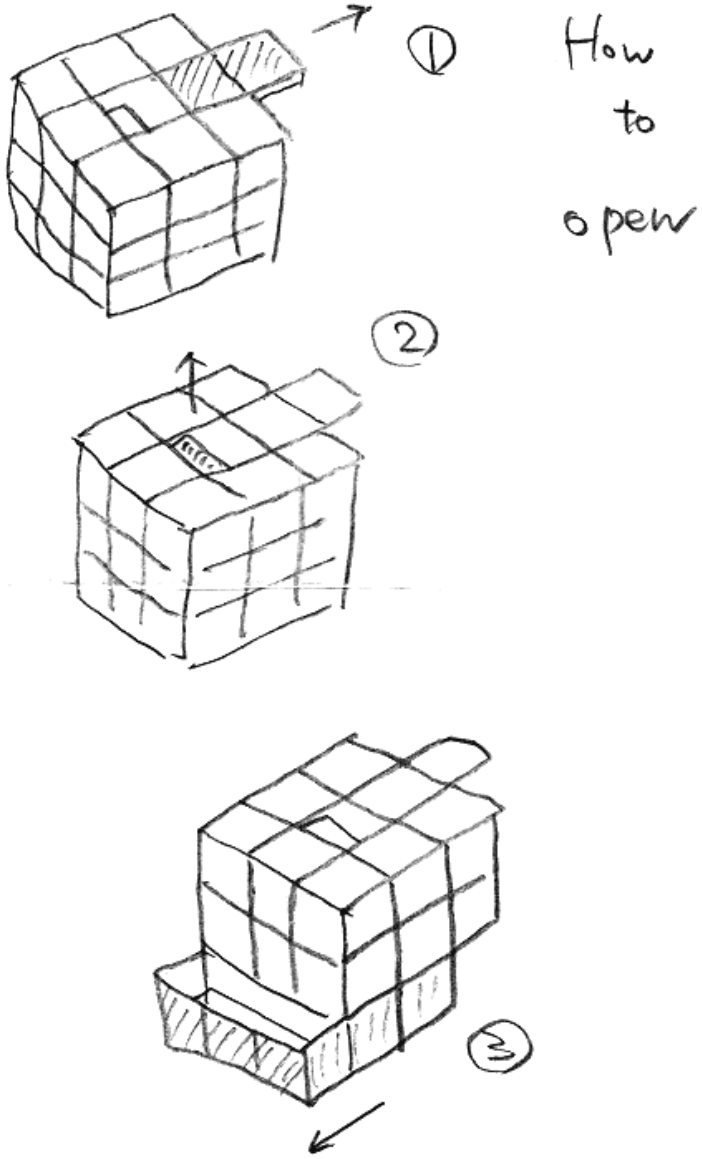


Copyright © 2002 IPP Design Competition
All rights reserved.

25

Jewelry Box

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

26 Key Ring

Puzzle Goal:

Take the two identical pieces apart. Then put them back together again, matching the two Scott Kim inversion words "Key" and "Ring".

Materials:

Metal

Classification: Routefinding, Sequential Movement

History:

I have used parity changes in many designs. The simplest example is the two topologically different ways to link two rings together. I used this concept to make a simple take-apart puzzle with two identical rings.

Then I needed something to indicate the start position. Two matching arrows or other symbols could do the trick, but that would look boring. Two matching words would be better. I chose the words “Key Ring”. However, the two pieces would become different, as the two words are different. Then I thought of Scott Kim. Scott made a beautiful Key Ring inversion for me and the two pieces became identical again.

Copyright © 2002 IPP Design Competition
All rights reserved.

26 Key Ring

Puzzle Solution:

The puzzle includes a parity change. After some turning moves you can almost take the puzzle apart. However, the shape of the two openings prevent full separation. At that point, the two pieces should be pushed completely through each other. Now the parity has changed and after a few more turning moves, you can pull the pieces apart.

Copyright © 2002 IPP Design Competition
All rights reserved.

27

Kinato

Puzzle Goal:

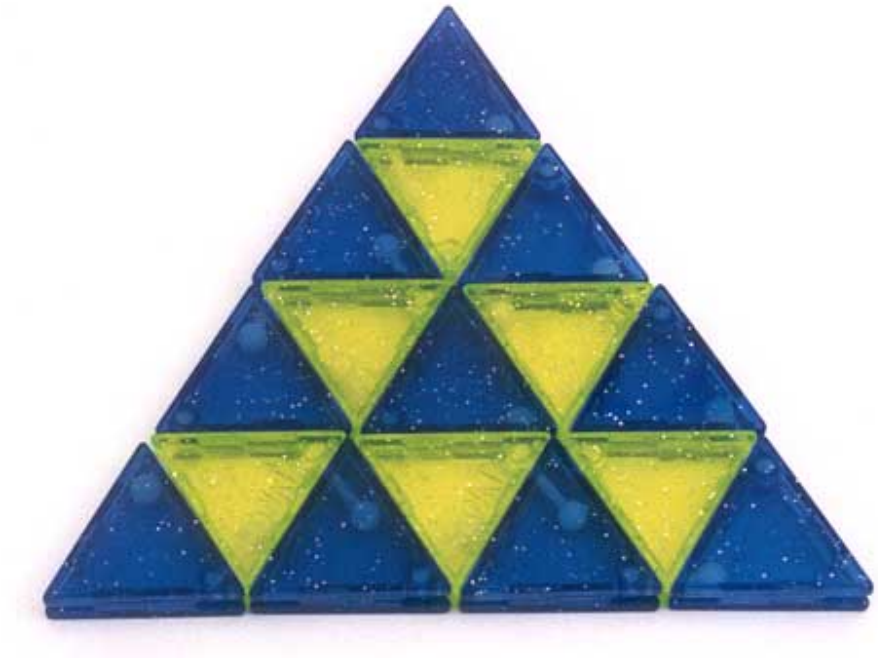
Primary goal: create an equilateral triangle with a "triangular checkerboard" pattern.

Additional patterns and Tangram-like shapes are given in the product booklet.

Materials:

PS Plastic

Classification: Silhouette puzzle



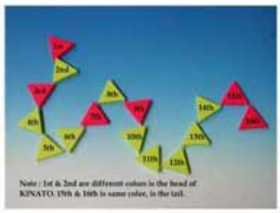
Notes:

KINATO is formed from small triangular plastic components linked together to form a chain. Each equilateral triangles is free to turn either from left to right or right to left by 60 , 120 , 180 , or 240 or it can be flipped upwards or downwards by 180 and 360 .

Copyright © 2002 IPP Design Competition
All rights reserved.

27 Kinato

Puzzle Solution:



Get ready

Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

Step 7

Step 8

Step 9

Step 10

Step 11

Completed !

Copyright © 2002 IPP Design Competition
All rights reserved.

28

Kubusmix

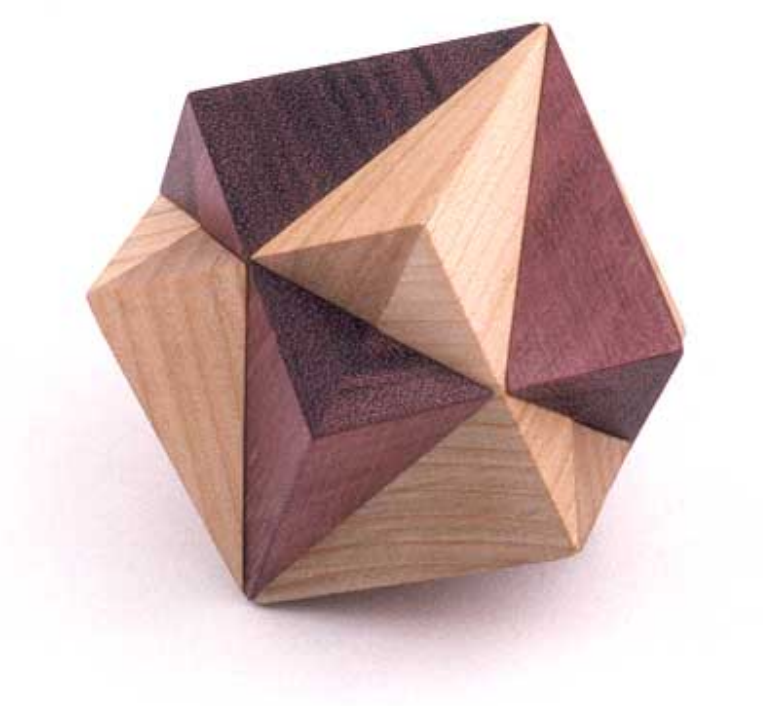
Puzzle Goal:

Assemble or disassemble the 6 interlocking pieces.

Materials:

Amarand and Pear

Classification: Interlocking



Notes:

The design was driven by the admiration of geometrical shapes, especially compounds of polyhedra. The mix of two cubes has not only a surprisingly new interlocking principle, but its 3D shape is also a pleasure to watch.

Copyright © 2002 IPP Design Competition
All rights reserved.

28 Kubusmix

Puzzle Solution:

Two halves, made of three parts each, will join.

Copyright © 2002 IPP Design Competition
All rights reserved.

29

Leaves Coaster Puzzle

Puzzle Goal:

Arrange the leaves against each other to form a triangle.

Arrange a triangle in which leaves of the same color touch each other.

Arrange a triangle in which leaves of the same color do not touch each other.

Just play with the leaves to make any shape you like.

Materials:

color ply birch wood

Classification: put together

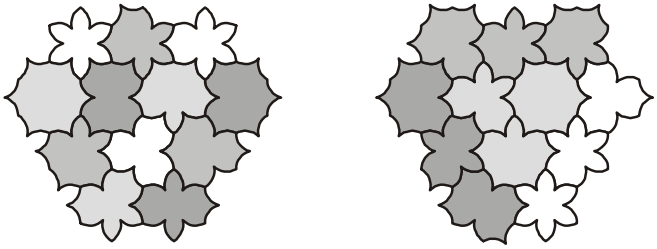
Notes:

This puzzle set consists of 12 different coasters. The basic form is a leaf with inside and or outside notches. All combinations (except for one asymmetrical) are in the set. Each leaf coaster is symmetrical in at least one way.

Copyright © 2002 IPP Design Competition
All rights reserved.

29 Leaves Coaster Puzzle

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

30 Literal Lateral Slide Puzzle

Puzzle Goal:

Take the puzzle entirely apart into all of its pieces and put it back together again.

Materials:

Walnut, Jatoba, and Jarrah

Classification: 3D Take-apart puzzle

Copyright © 2002 IPP Design Competition
All rights reserved.

30 Literal Lateral Slide Puzzle

Puzzle Solution:

The trick to the puzzle is that there are not six pieces as it appears, but seven. If all four pieces are out, the puzzle is locked and no further steps can be made. The solution is to pull one side out (try all six until one pulls out), then a second side out, then the third side ACROSS from the original side. Now put your finger in the opening where the first side came out and feel around until you can push the hidden seventh piece "laterally" towards the third side. This unlocks a fourth side-the piece to be removed, solving the puzzle. Do not take the puzzle further apart unless you have some spare time on your hands.

Copyright © 2002 IPP Design Competition
All rights reserved.

31 Lost In Space

Puzzle Goal:

Starting position: 16 puzzle pieces are fitted into the bigger square of the playing board filling the square, with the extra square piece sitting in the small square of the puzzle board.

Goal: rearrange the puzzle pieces so that all 17 pieces fit into the big square of the puzzle board.

Materials:

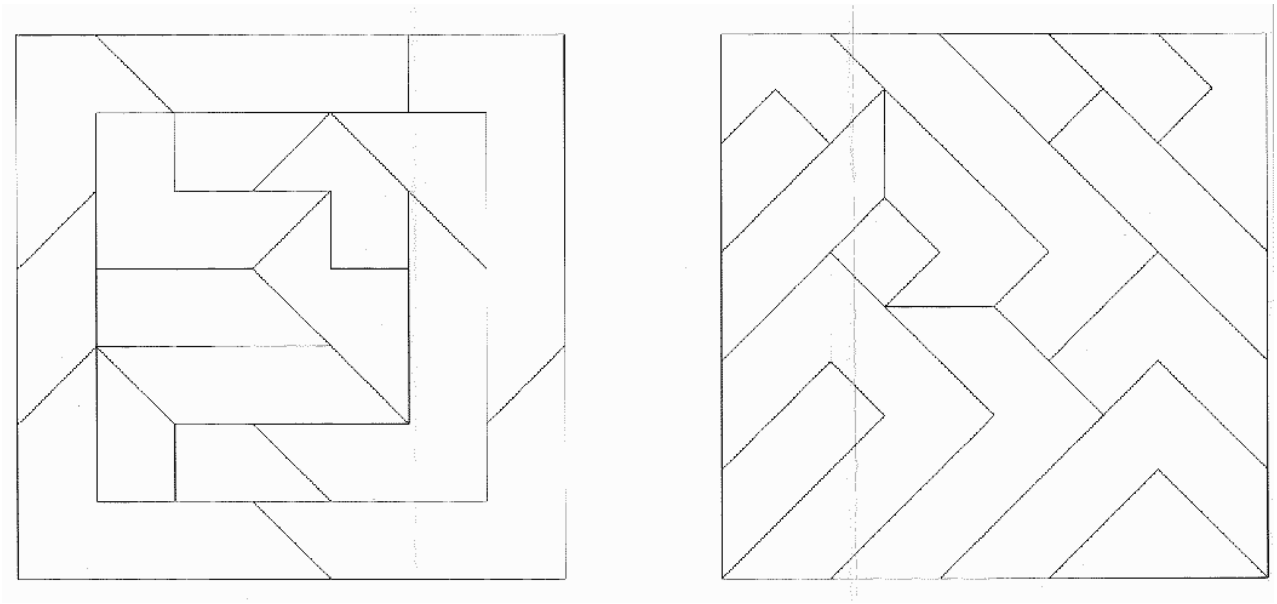
Birch plywood, cherry, ash, walnut

Classification: Put-Together

Copyright © 2002 IPP Design Competition
All rights reserved.

31 Lost In Space

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

32 Lox In Box

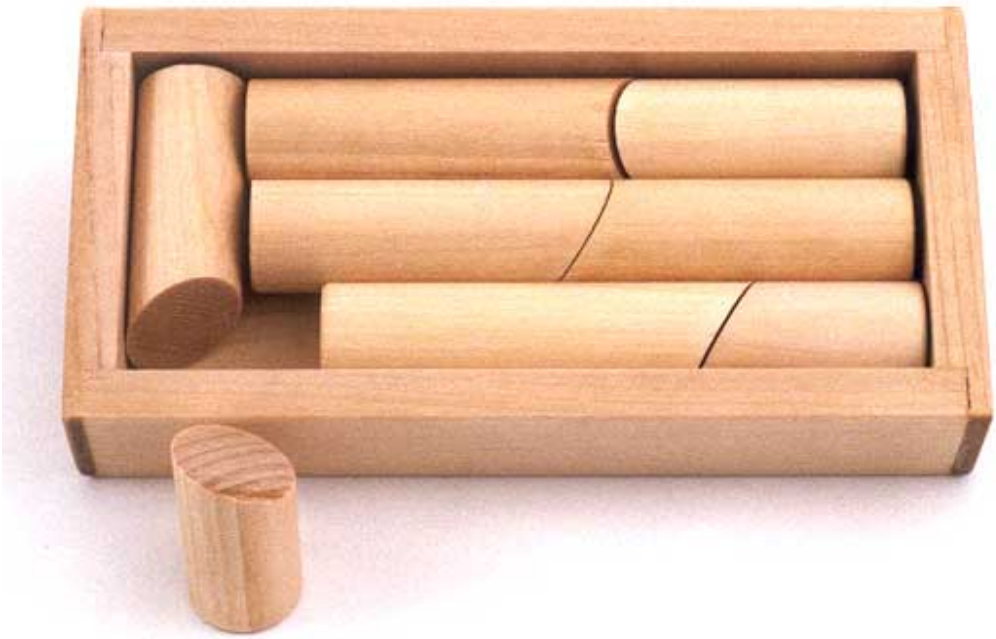
Puzzle Goal:

Put logs (lox) into the box.

Materials:

Birch

Classification: Put together

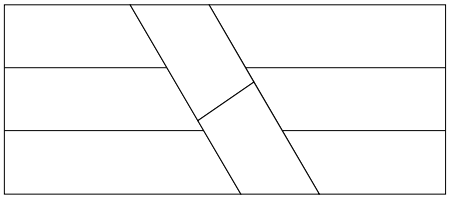


Copyright © 2002 IPP Design Competition
All rights reserved.

32

Lox In Box

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

33 LT

Puzzle Goal:

1. Use all seven pieces to make the letter L

2. Use all seven pieces to make the letter T

3. The real challenge is to use all seven pieces to make the letters L and T at the same time.

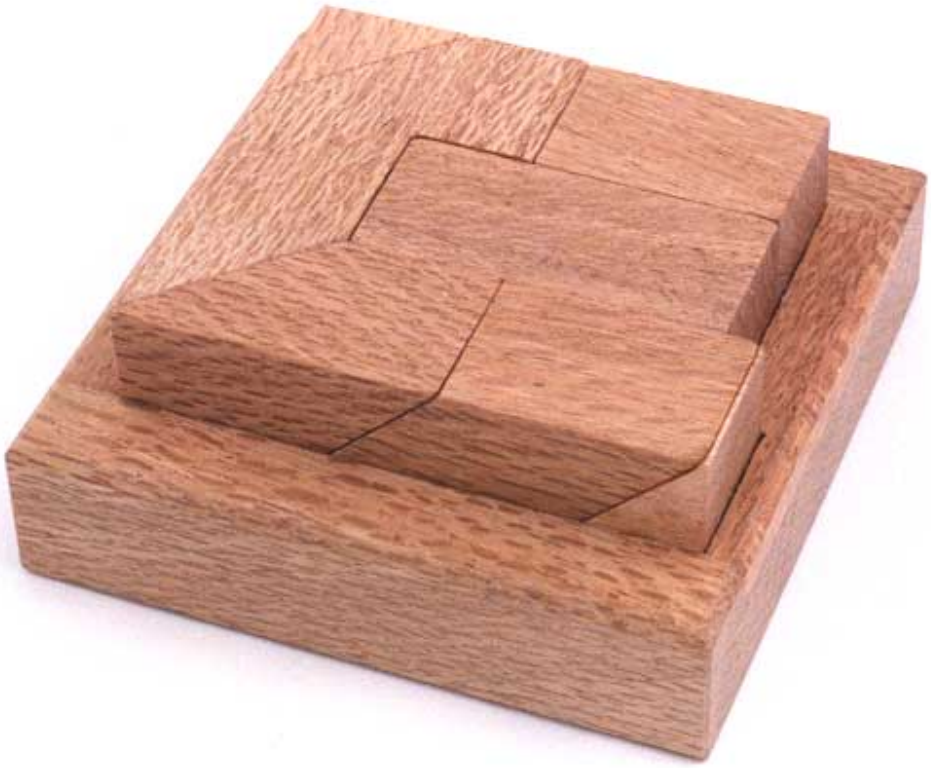
Note: the dimensions of the vertical and horizontal strokes in the letters L and T are in all cases exactly equal and symmetrical.

For some even getting the puzzle back into the tray may be a challenge.

Materials:

Queensland Silky Oak (Lacewood)

Classification: Put Together

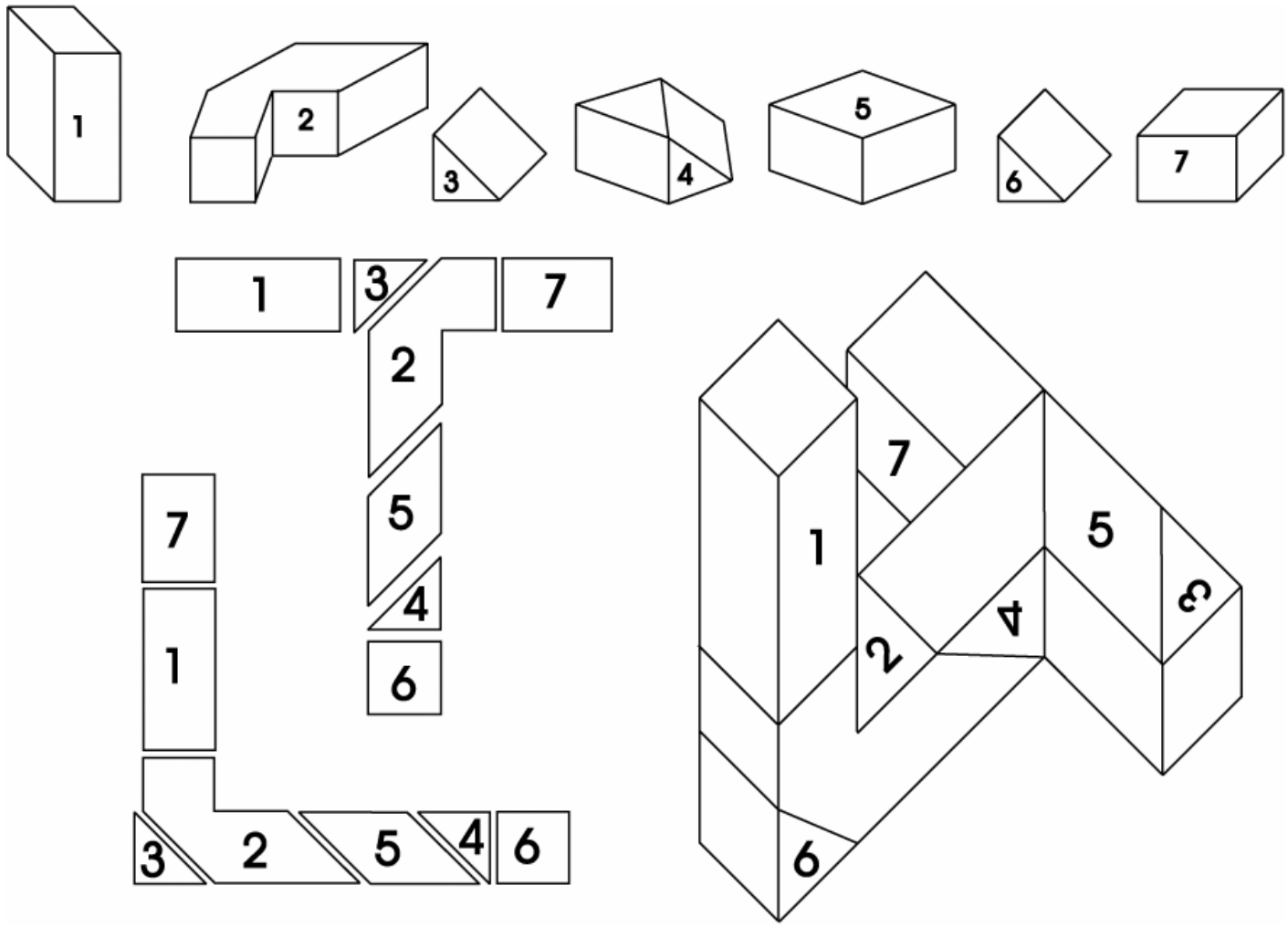


Copyright © 2002 IPP Design Competition
All rights reserved.

33

LT

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

34 Minimatch

Puzzle Goal:

Match the 9 pieces by color in 3x3 tray and other shapes.

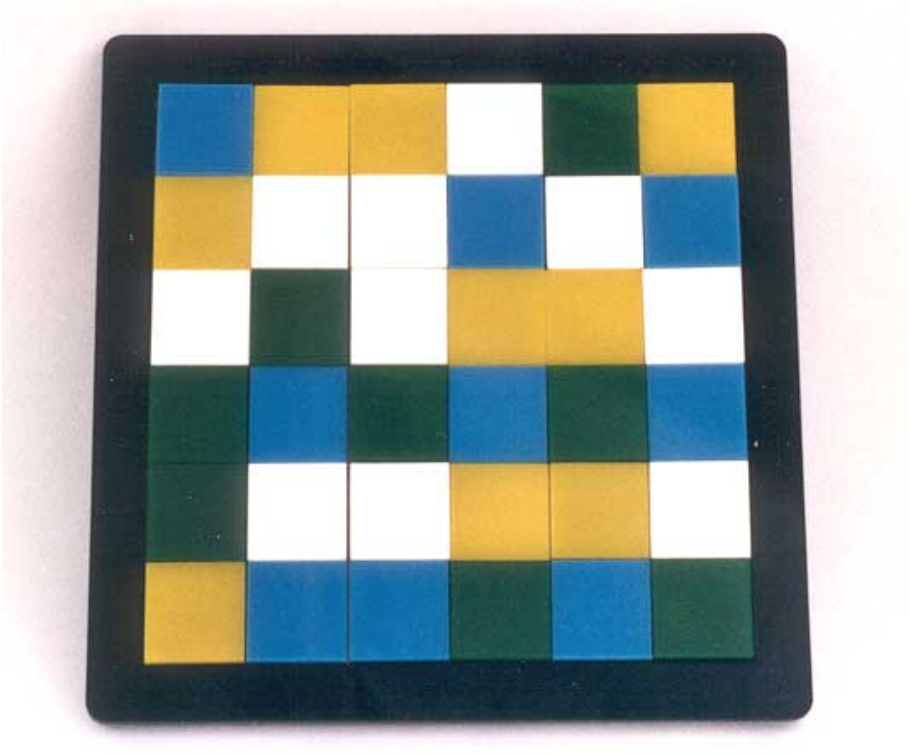
Form the 3x3 with non-matched colors, and with symmetry of one color.

In a non-match solution, maximize larger squares with uniform corners.

Materials:

Lasercut acrylic in yellow, white, blue, green.

Classification: 3x3 Edge-matching



History:

In the beginning was Percy MacMahon. His edge-colored Three-Colored Squares were published in his More Mathematical Pastimes in 1926. These inspired others to postulate vertex-colored squares. Using all permutations of three colors, these sets produce 24 distinct tiles each. (See Kadon's Multimatch I and Multimatch II.)

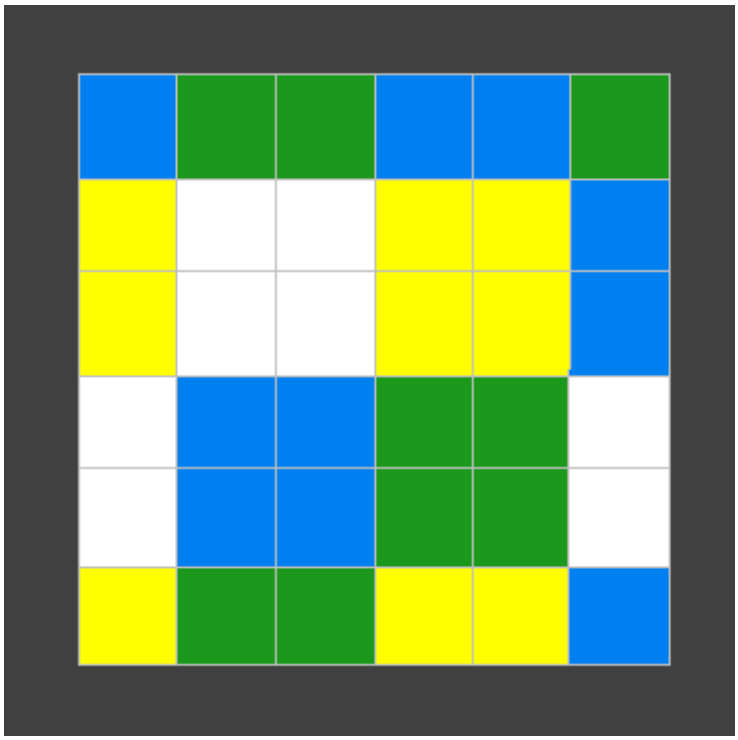
Using four colors expands the sets to 70 tiles. (See Adrian Fisher's Quartermaster and Kadon's Grand Snowflake for embodiments of the edge-marked four-color sets.)

A subset of the 70 corner-colored squares is the present challenge: Minimatch. Just 9 tiles form a 3x3 square with all joined edges matching on both corners. Six of the tiles contain all four colors in every possible order. The other three tiles have three colors, with the duplicate corners diagonally opposite ("bow-ties"). The number of solutions is unknown. It is proven that the center tile cannot be a bow-tie.

Copyright © 2002 IPP Design Competition
All rights reserved.

34 Minimatch

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

35

Nine-Piece, Nine-Color

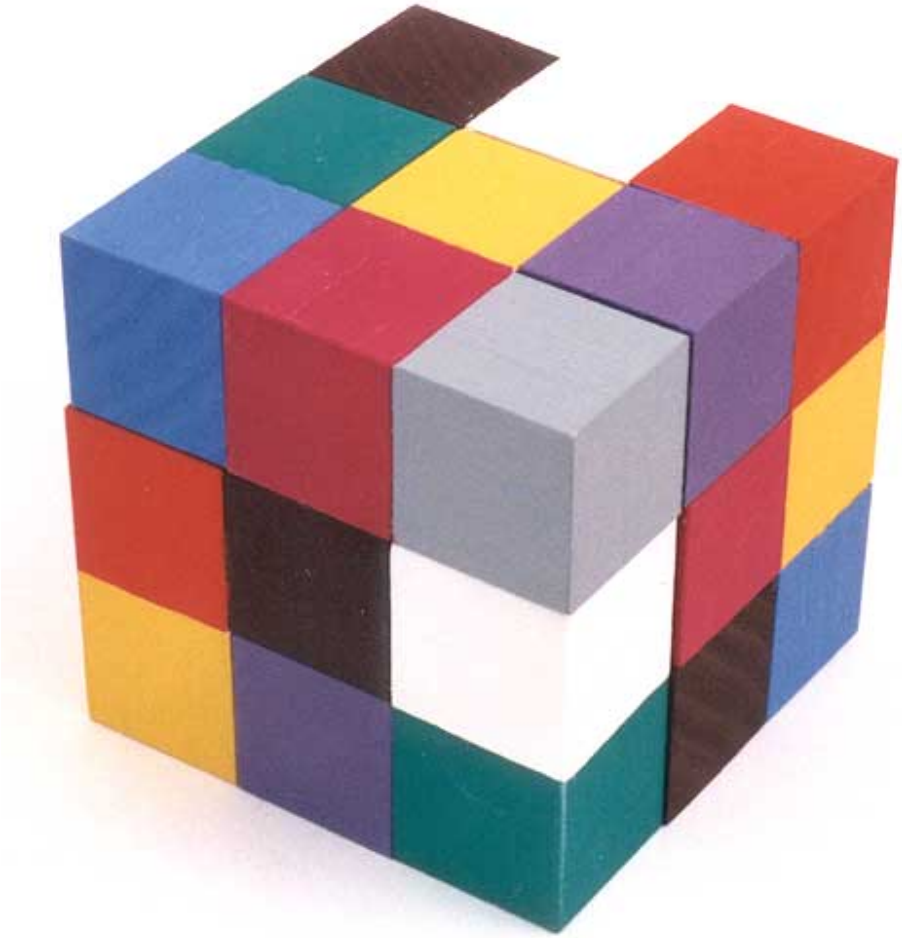
Puzzle Goal:

Assemble the nine colored tricubes into a 3x3x3 cube such that nine different colors are displayed on the six faces of the cube.

Materials:

White poplar; acrylic paint

Classification: Assembly



Copyright © 2002 IPP Design Competition
All rights reserved.

35 Nine-Piece, Nine-Color

Puzzle Solution:

This is one of 1320 possible ways to color the 9 pieces to give a unique assembly.

The letters below identify the 9 pieces; the corresponding numbers show the colors for each block. For example, piece A covers the center of the cube, and is made up of brown, orange, and blue colored cubes.

BAC	**BBC**	**FFG**	**123**	**978**	**564**
DAC	**HAE**	**FGG**	**456**	**312**	**897**
DDE	**HIE**	**HII**	**789**	**645**	**231**

1. Blue	**2. Brown**	**3. Green**
4. Grey	**5. Orange**	**6. Purple**
7. Red	**8. White**	**9. Yellow**

Copyright © 2002 IPP Design Competition
All rights reserved.

36 Optimal Pentominoes Checkerboard

Puzzle Goal:

Main problem: Put the 12 pentominoes and one tetromino to form a checkerboard. Find a solution for each of 7 tetrominoes. The pieces are one-sided.

Problem #2: Fill two trays in checkerboard fashion: the smaller one only with tetrominoes and the larger one with 12 pentominoes and one tetromino.

Materials:

Wood (ash-tree)

Classification: Put-together

History:

The problem of the well-known Dudeney's puzzle "The Broken Chessboard" first published in 1907 is to put the 12 pentominoes and the square tetromino together to form the checkerboard. The solution of this puzzle is not unique.

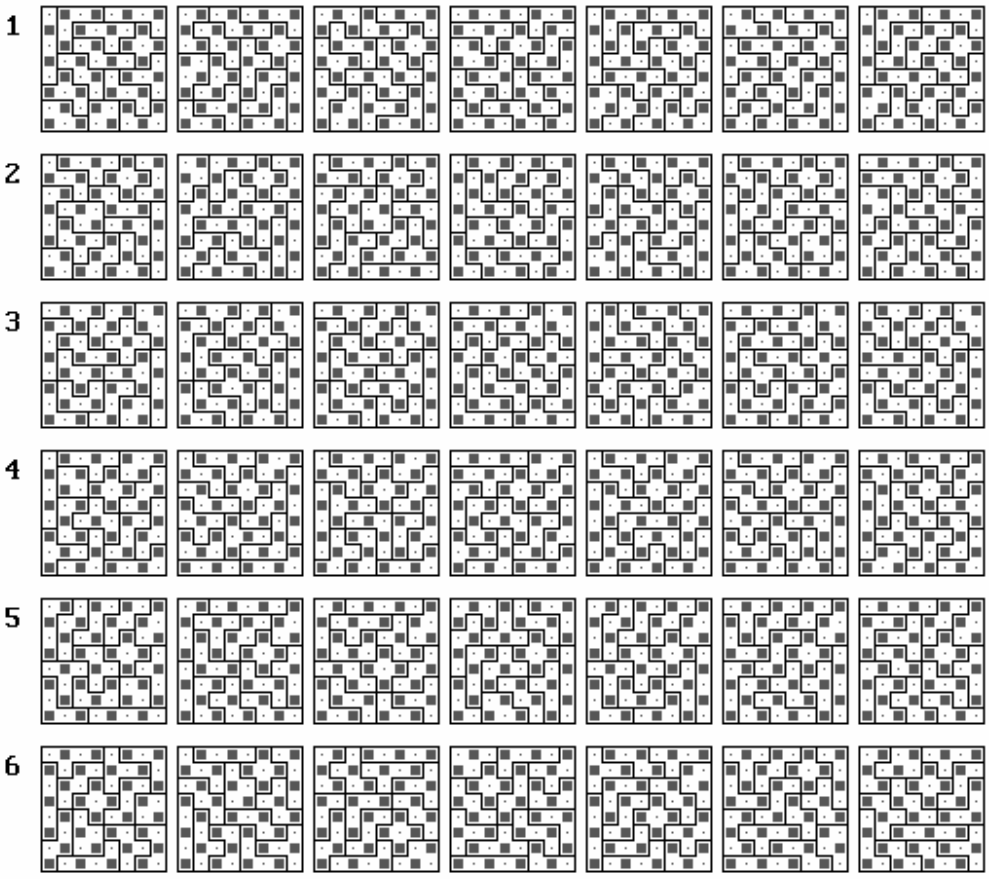
The main problem was posed in 1993 and solved in 2000 by a computer program written by A. Blumbergs, namely the one of finding the checkering(s) of 12 pentominoes having a unique solution for as many checkered tetrominoes as possible. Additional information can be found in CFF 53, Oct., 2000, pp28-30.

Copyright © 2002 IPP Design Competition
All rights reserved.

36 Optimal Pentominoes Checkerboard

Puzzle Solution:

Sample solutions for main problem:



Copyright © 2002 IPP Design Competition
All rights reserved.

37

Partita

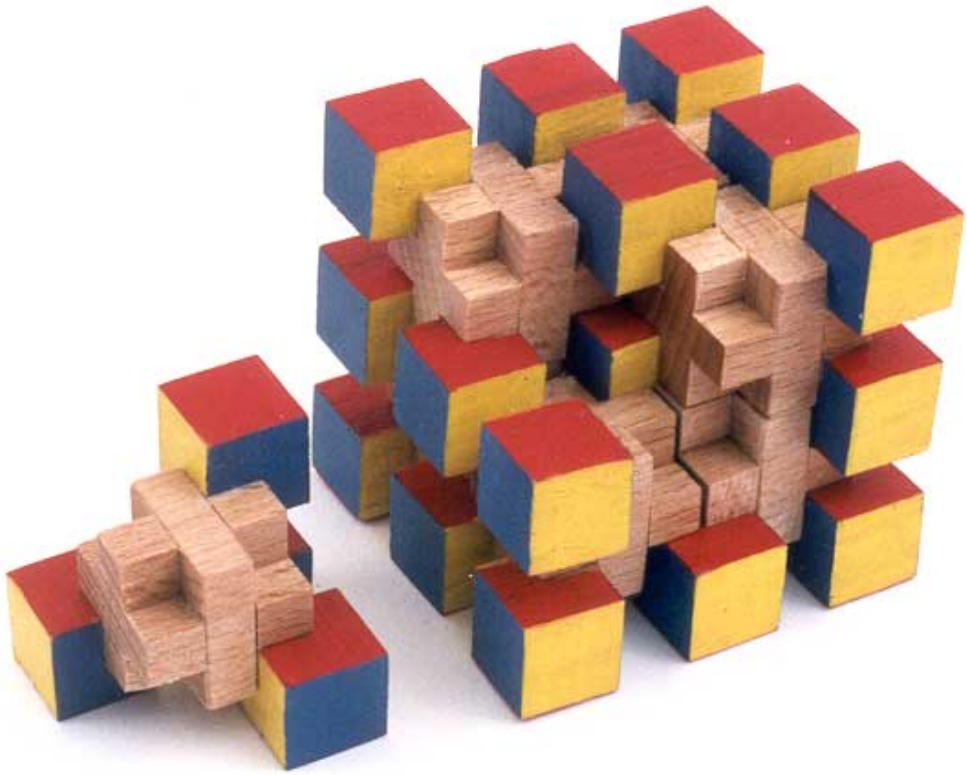
Puzzle Goal:

The object of the puzzle is to assemble the pieces into a size 3 cube with solid color faces.

Materials:

Painted wood

Classification: Put together



History:

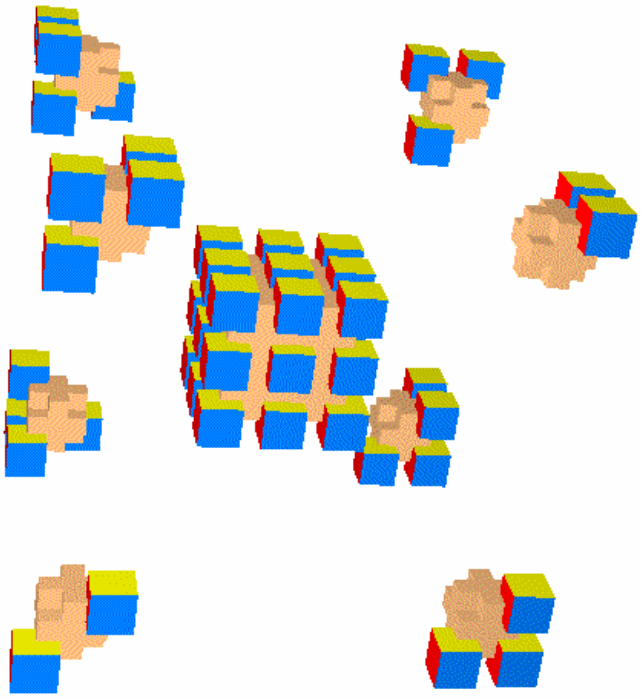
The eight pieces have been chosen from the set of twenty-two polycubes (including disjoints) that fit insides a 2x2x2 cubic matrix. An earlier description of this piece set was published by Michael R. Straight, but no previous mechanical puzzle designs using them have been found.

Copyright © 2002 IPP Design Competition
All rights reserved.

37

Partita

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

38

Pear Puzzle

Puzzle Goal:

Puzzle 1 requires the separation of the Pear into halves.

Puzzle 2 requires the removal of the freely rotating cover to the bottom compartment of the Pear.

Puzzle 3 requires the opening of the upper half of the Pear.

Materials:

Pink ivory

Classification: Take-apart

Copyright © 2002 IPP Design Competition
All rights reserved.

38 Pear Puzzle

Puzzle Solution:

Puzzle 1: Invert the Pear, give it a shake and unscrew the two halves in a clockwise direction, thus releasing the coin inside. To reassemble, with the Pear inverted, screw back the bottom half counter-clockwise, reverse the Pear, tap it sharply into the palm of the other hand and jiggle the top half until the bolt engages.

Puzzle 2: Unscrew the "flower" plug in the base to reveal a threaded hole giving access to the rotating chamber in the bottom half of the Pear. Rotate the chamber until the hole lines up with a corresponding hole in the chamber. Unscrew the stalk and use this to screw the chamber and base together. The lid of the chamber can now be unscrewed in a clockwise direction to release the coin inside. To reassemble, simply reverse this sequence.

Puzzle 3: Using one of the released coins to unscrew the slotted lid of the upper compartment, as in the traditional Hoffmann Castle Money-box, it will be found that the lid will not unscrew as expected - in either direction. This is because the lid is, in fact, two counter-rotating threaded disks, so that as one is eased (in either direction) the other is tightened. The solution, therefore, is, first, to engage only the top disk with the coin, when it will readily unscrew (clockwise), and then to unscrew the lower disk in the usual counter-clockwise direction. To reassemble, screw back the lower disk (clockwise), then unscrew a quarter-turn, replace the upper disk (counter-clockwise) and tighten until the slots are aligned.

N.B. It is important to replace each disk the correct way up! A little practice may also be necessary to get the alignment just right.

Copyright © 2002 IPP Design Competition
All rights reserved.

39

Pineapple Secret

Puzzle Goal:

Open the secret compartment

Materials:

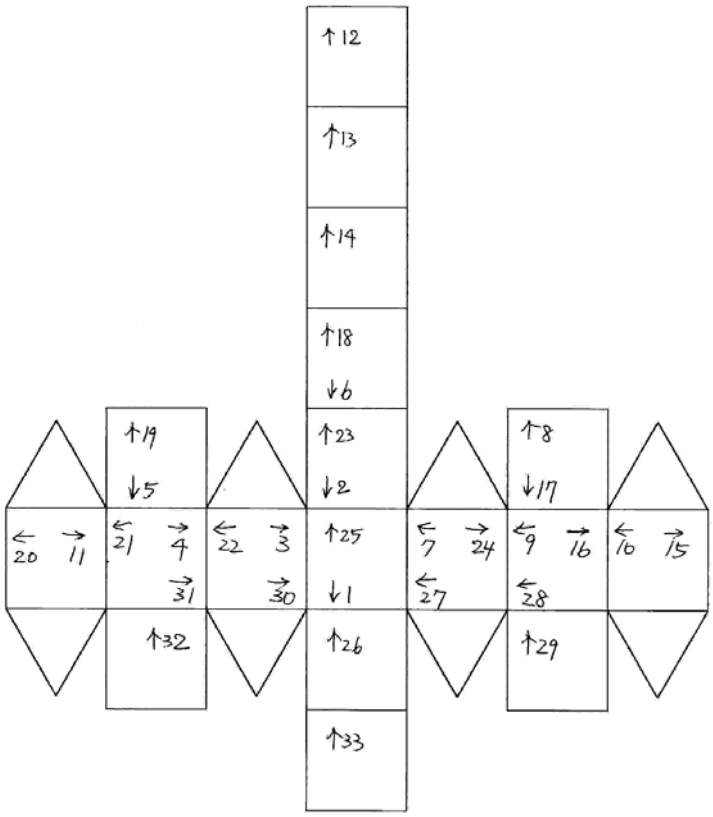
katsura, keyaki, wenge, etc.

Classification:

Copyright © 2002 IPP Design Competition
All rights reserved.

39 Pineapple Secret

Puzzle Solution:



There are 8 plates, placed like the equator of the earth. They are placed on a line, and are related each other. These 8 plates are "main mechanism". They realize a motion of "4 move Secret Box" as a whole. It's a movement of "back and forth".

Add to this, there is a right hemisphere and left hemisphere. This is the "substitution mechanism".

When you slide plates, sub-mechanisms will obstruct main mechanism. The shape of sub mechanism is a cross, and it has 4 devices to obstruct main ones. Moreover, there are 2 sub mechanisms, each obstructing with a time lag.

For the light pine version, the movement is basic. There is an alternate dark version with a different polyhedron and movement.

Copyright © 2002 IPP Design Competition
All rights reserved.

40 Pinnex

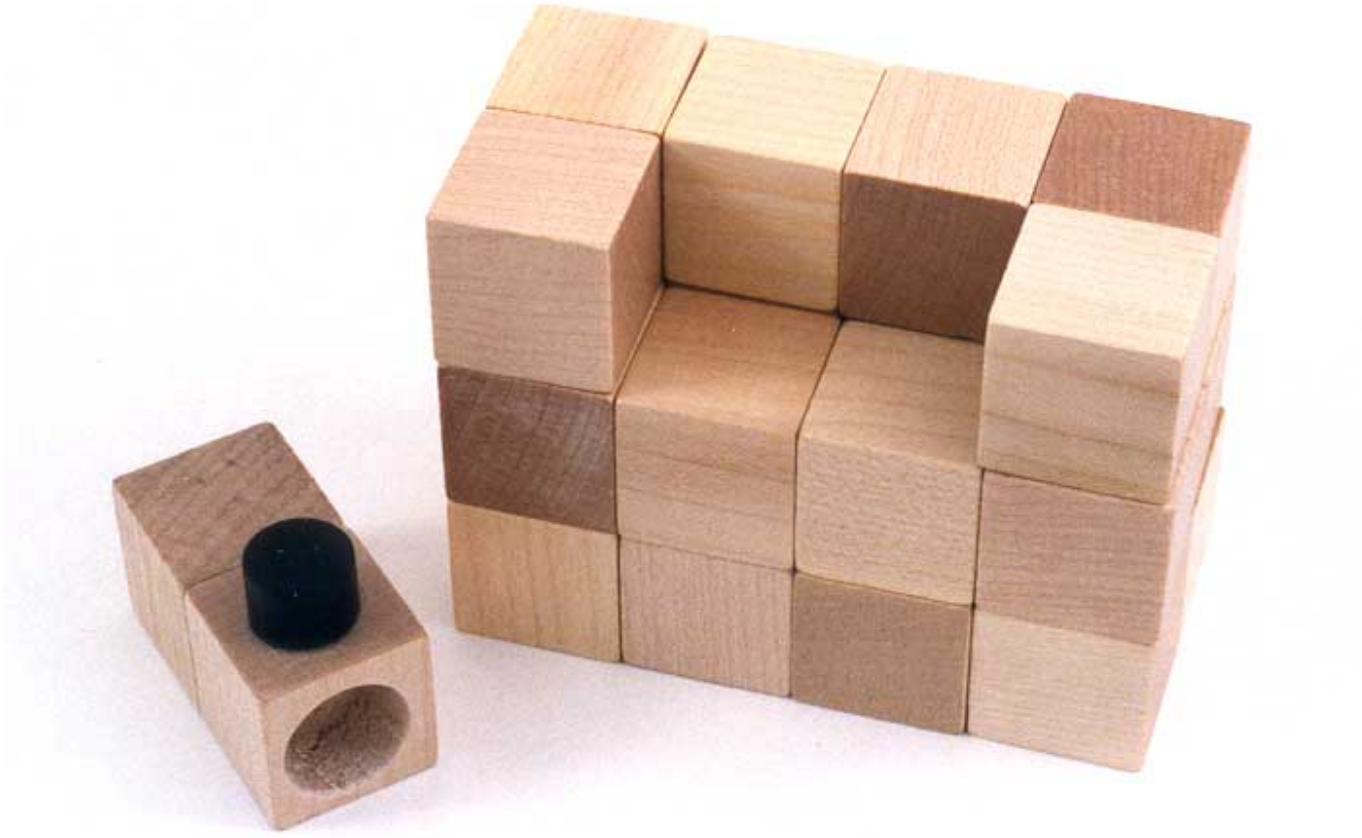
Puzzle Goal:

Build objects with the blocks by fitting each pin in a hole of a next block in such a way that you cannot see any pin or hole from the outside. Several objects are in the booklet.

Materials:

blocks: blanc ahorn wood; pins: black ahorn wood

Classification: put together



Notes:

This puzzle consists of a logically complete set of 12 different building blocks. Each block measures 1 x 1 x 2 units and has one pin and one hole.

Copyright © 2002 IPP Design Competition
All rights reserved.

40 Pinnex

Puzzle Solution:

See puzzle booklet.

Copyright © 2002 IPP Design Competition
All rights reserved.

41 Polo-Shirt Case

Puzzle Goal:

Place four Polo-Shirts flat in the both sides of frames.

Materials:

MDF board

Classification: 2D put-together

Copyright © 2002 IPP Design Competition
All rights reserved.

41 Polo-Shirt Case

Puzzle Solution:

Solution not provided.

Copyright © 2002 IPP Design Competition
All rights reserved.

42

Polyhedron32 puzzle

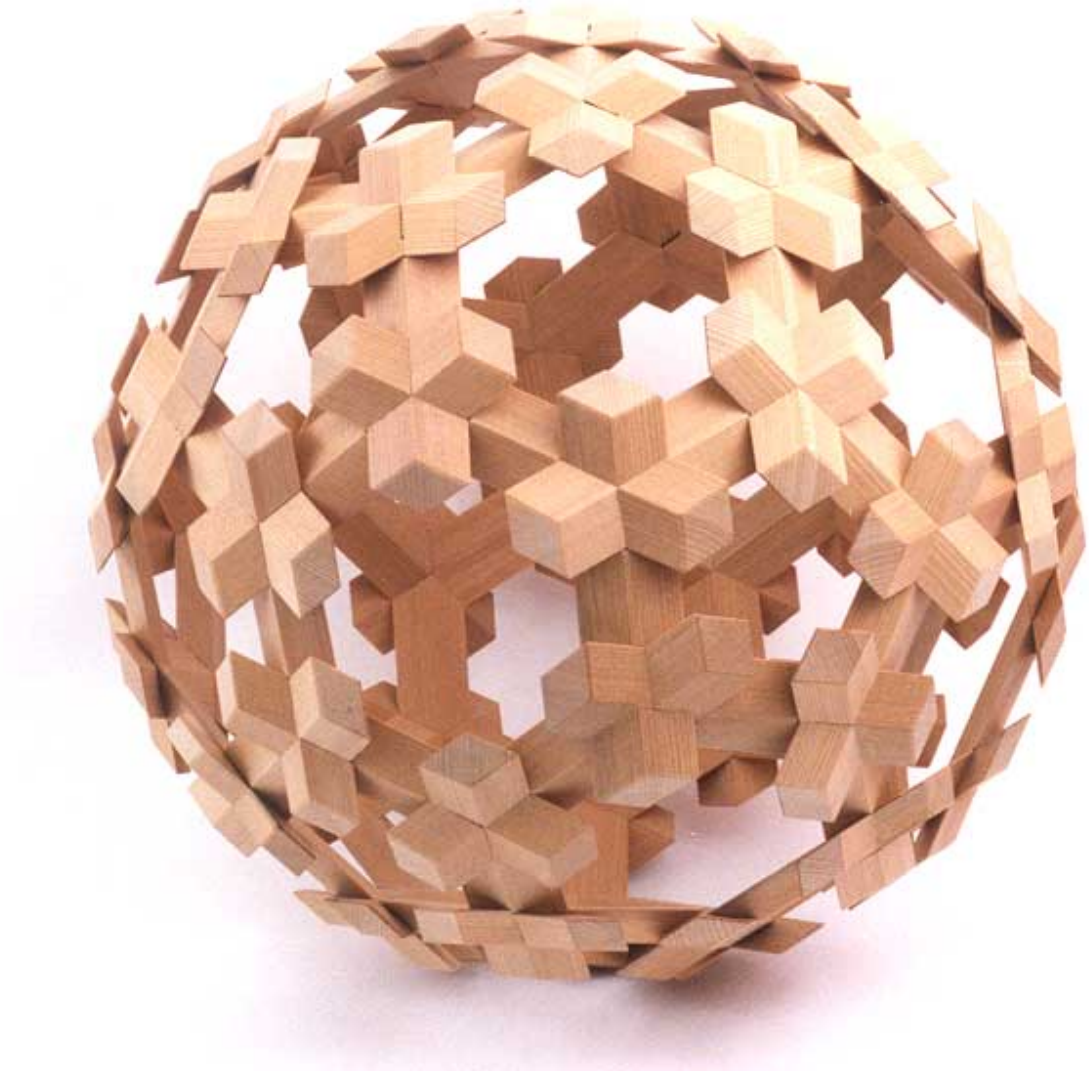
Puzzle Goal:

Disassemble and reassemble the figure.

Materials:

Taiwanese cypress

Classification: Interlocking



Copyright © 2002 IPP Design Competition
All rights reserved.

42 Polyhedron32 puzzle

Puzzle Solution:

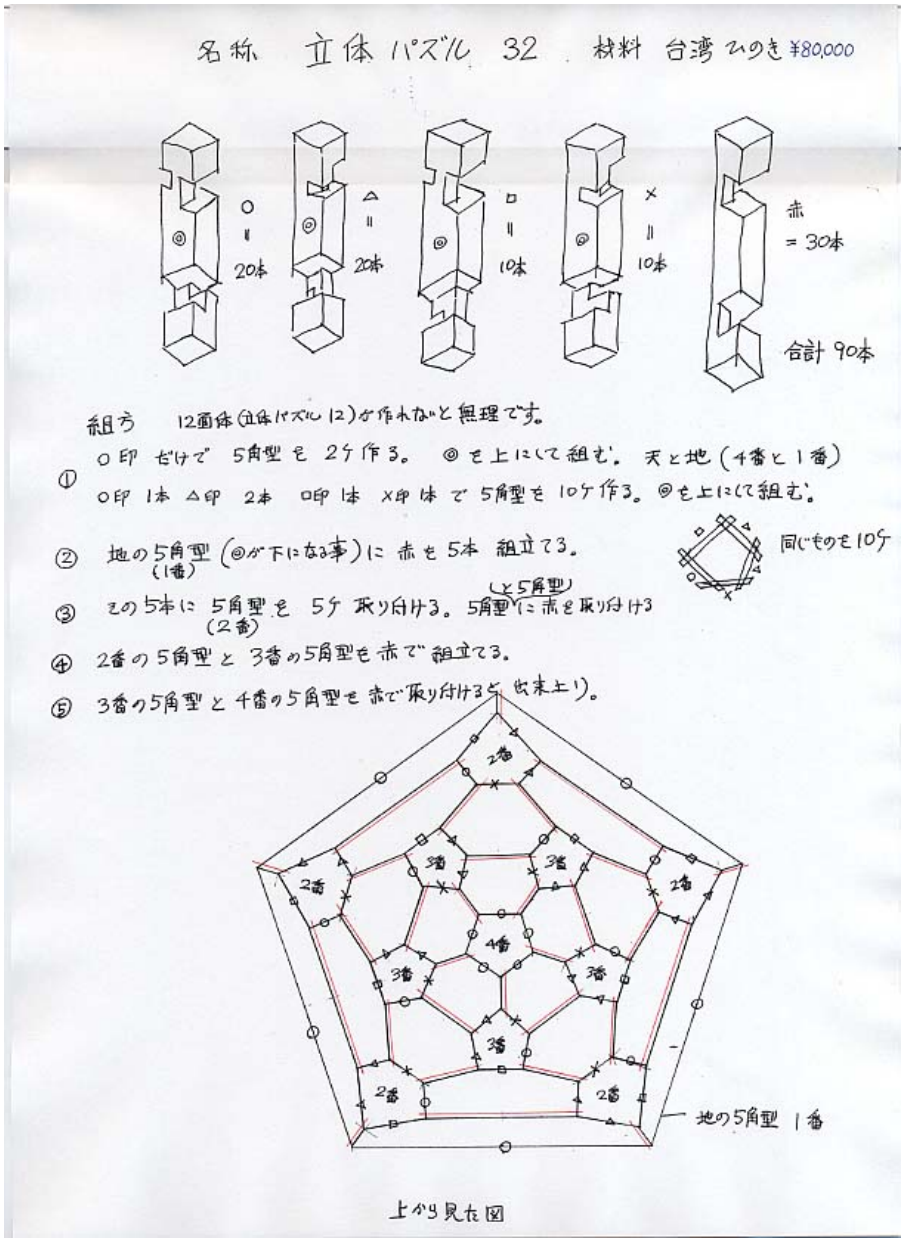
1) Make two pentagons using 10 pieces as circle upward double circle side. It comes Pentagon-4(top side) and Pentagon-1(bottom side). Make 10 pentagons using a piece as circle and two pieces as triangle and a piece as square and a piece as x upward double circle side. It comes Pentagon-2 and Pentagon-3.

2) Build 5 pieces as red on Pentagon-1 which is toward downside double circle side.

3) Put five Pentagon-2 and connect with five pieces as red.

4) Build five Pentagon-3 using ten pieces as red.

5) Build a Pentagon-4 using five pieces as red. Finish.



Copyright © 2002 IPP Design Competition
All rights reserved.

43 Princess Heart

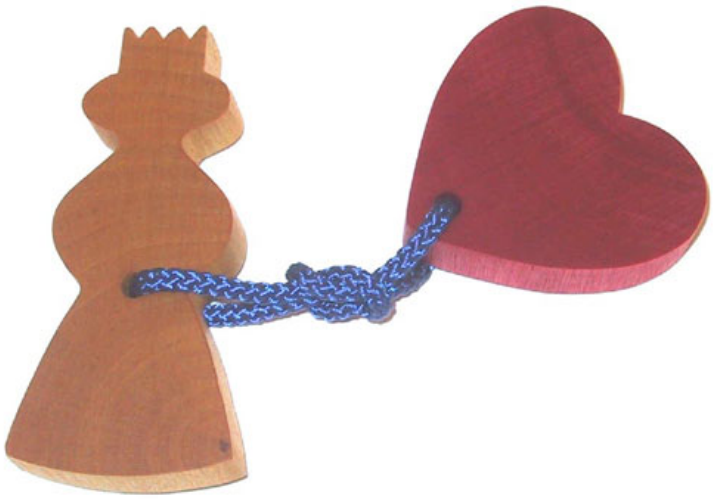
Puzzle Goal:

Untie the heart from the princess

Materials:

Birch wood and polyester rope

Classification: Disentanglement

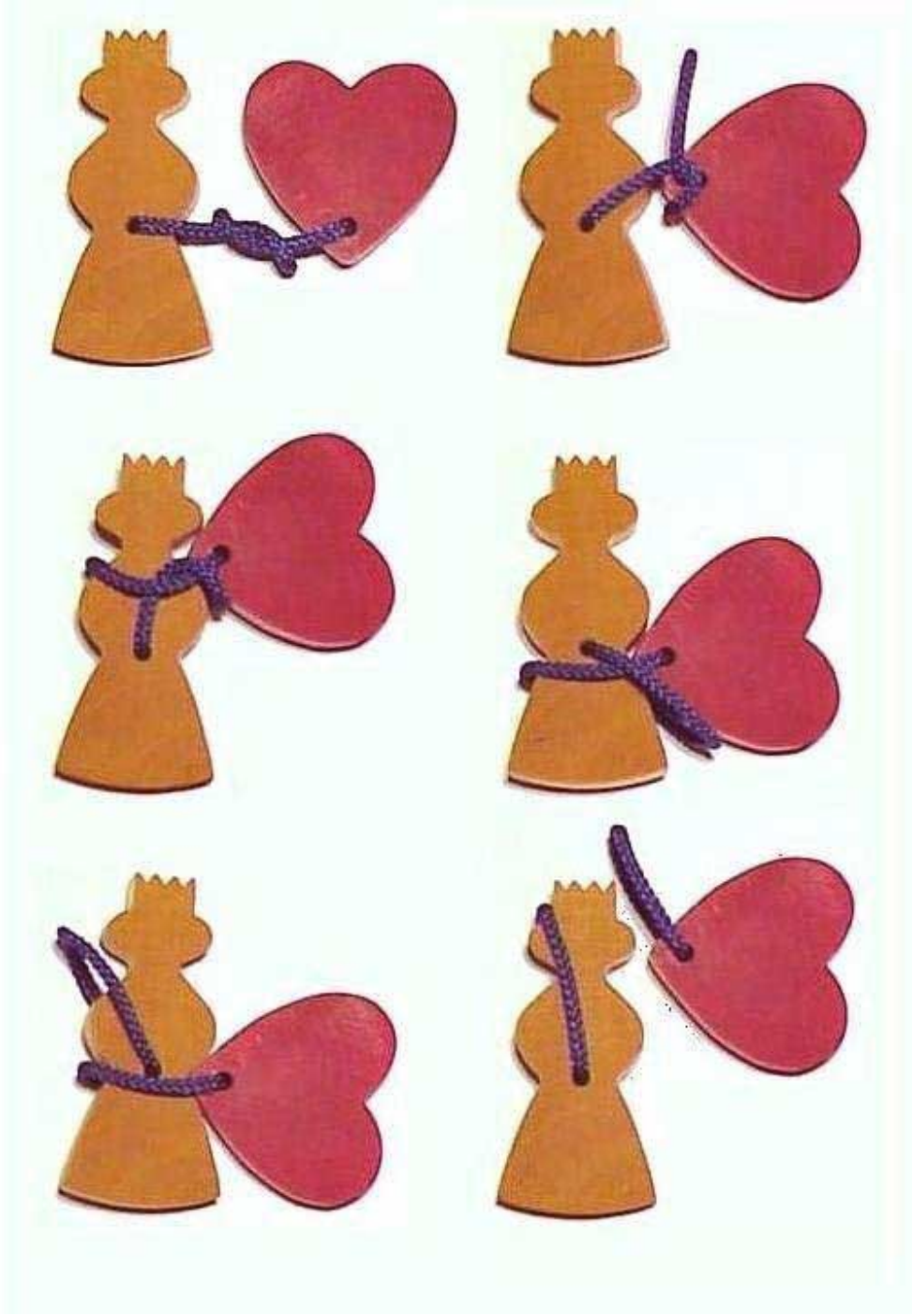


Copyright © 2002 IPP Design Competition
All rights reserved.

43

Princess Heart

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

44 Q-Burr

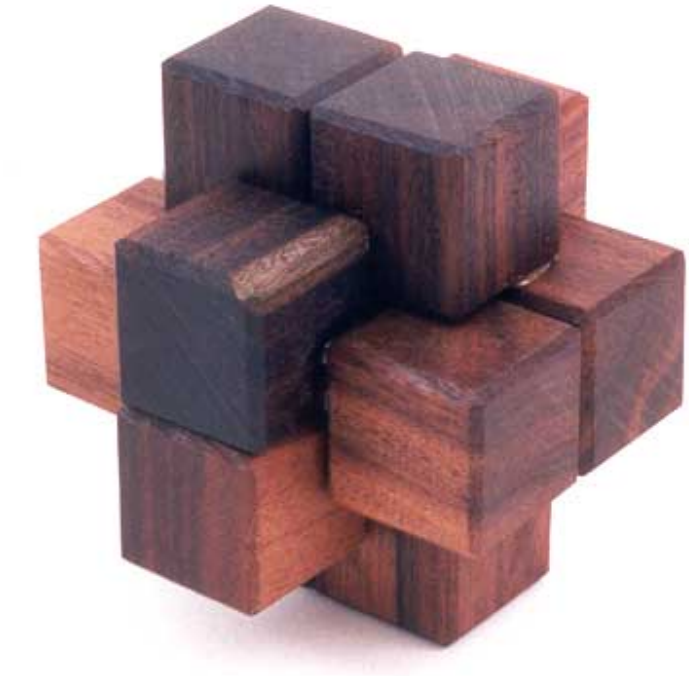
Puzzle Goal:

The goal is to assemble the three pieces into the shape of the classic 6-piece burr.

Materials:

Rosewood, finished with Velvit Oil; joints are doweled and glued.

Classification: Interlocking

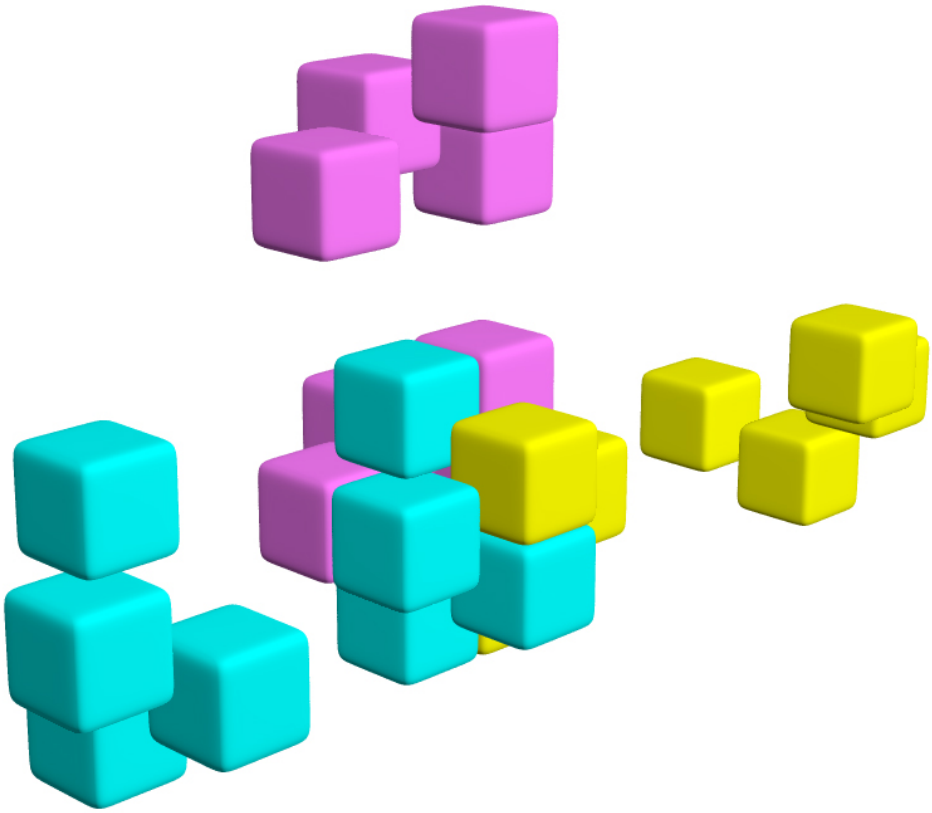


Copyright © 2002 IPP Design Competition
All rights reserved.

44 Q-Burr

Puzzle Solution:

The following exploded diagram shows the pieces in their positions relative to each other, as well as the final assembled shape.



Copyright © 2002 IPP Design Competition
All rights reserved.

45 Rope-ladder

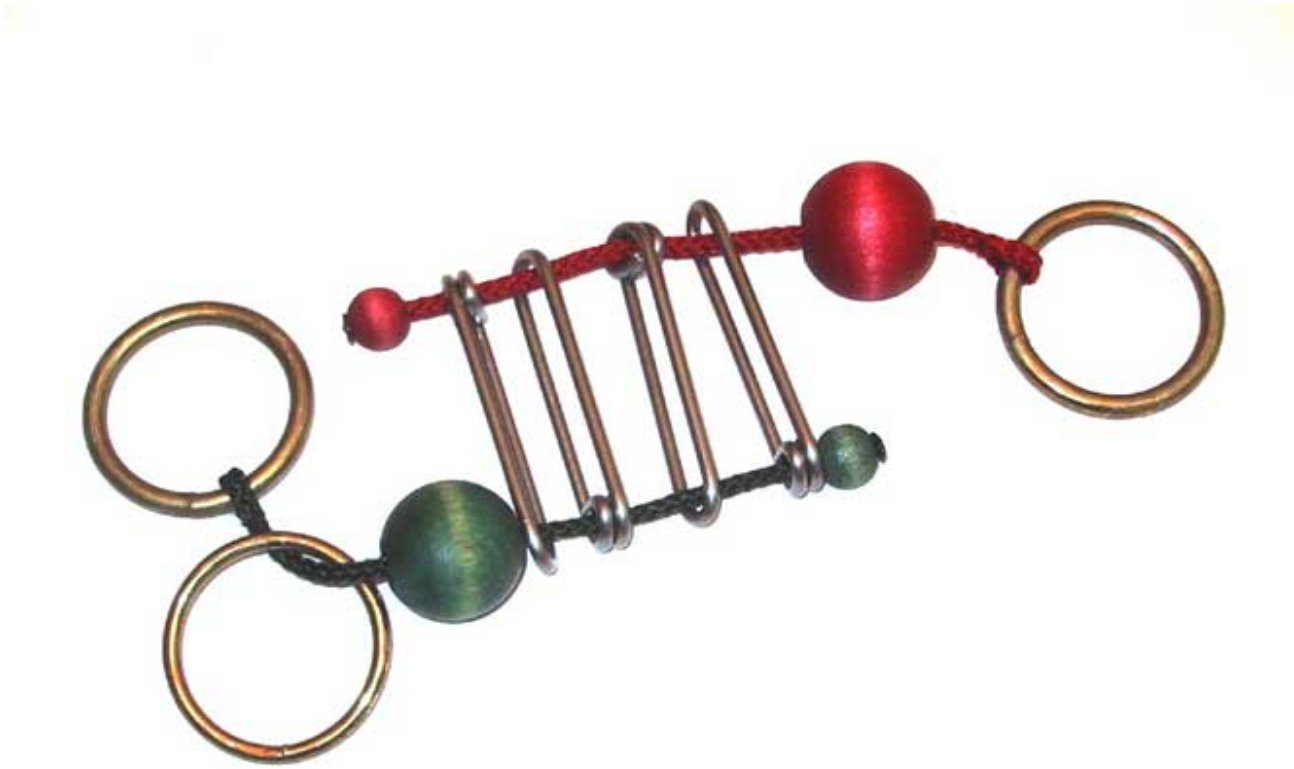
Puzzle Goal:

Remove the loose metal ring.

Materials:

Birch wood, metal ring, stainless thread and polyester rope

Classification: Disentanglement



Copyright © 2002 IPP Design Competition
All rights reserved.

45 Rope-ladder

Puzzle Solution:

Copyright © 2002 IPP Design Competition
All rights reserved.

46

Soma Summarum

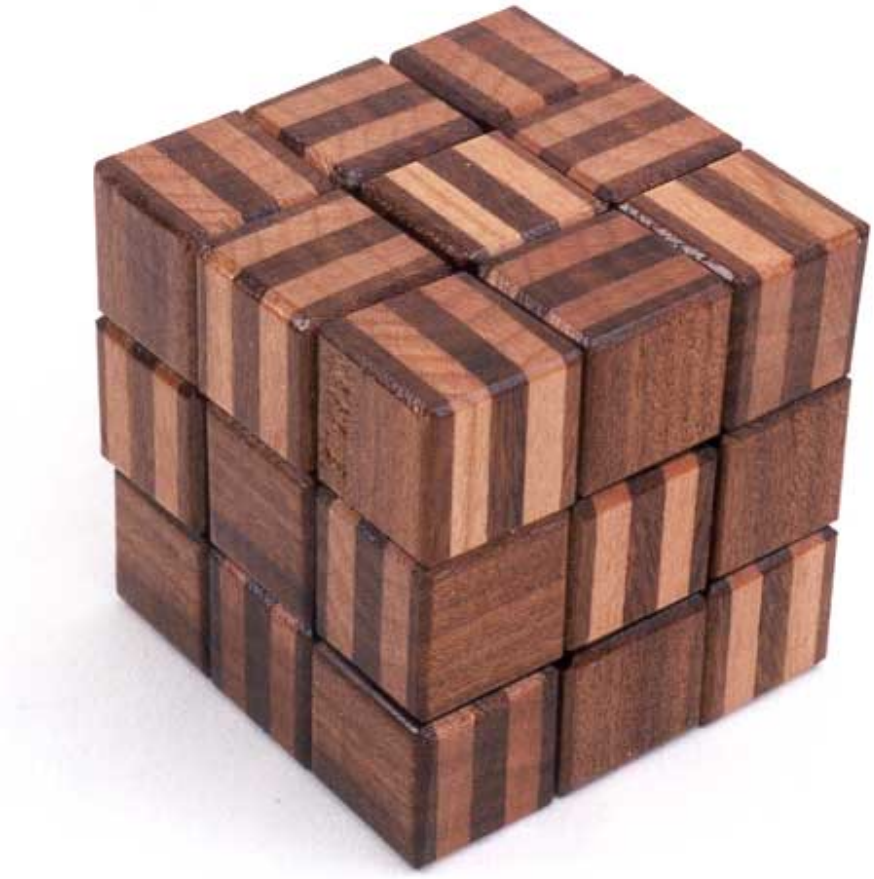
Puzzle Goal:

Arrange the seven Soma pieces to form a 3*3*3 cube
in such a way that each side of the cube shows an ordered checkered pattern.

Materials:

Cherry, Afromosia

Classification: Put-Together



Copyright © 2002 IPP Design Competition
All rights reserved.

46 Soma Summarum

Puzzle Solution:

```
KKB|KWB|RWW
KBB|GRO|RRO
GYO|GYO|GYY
```

Copyright © 2002 IPP Design Competition
All rights reserved.

47 Square Dance

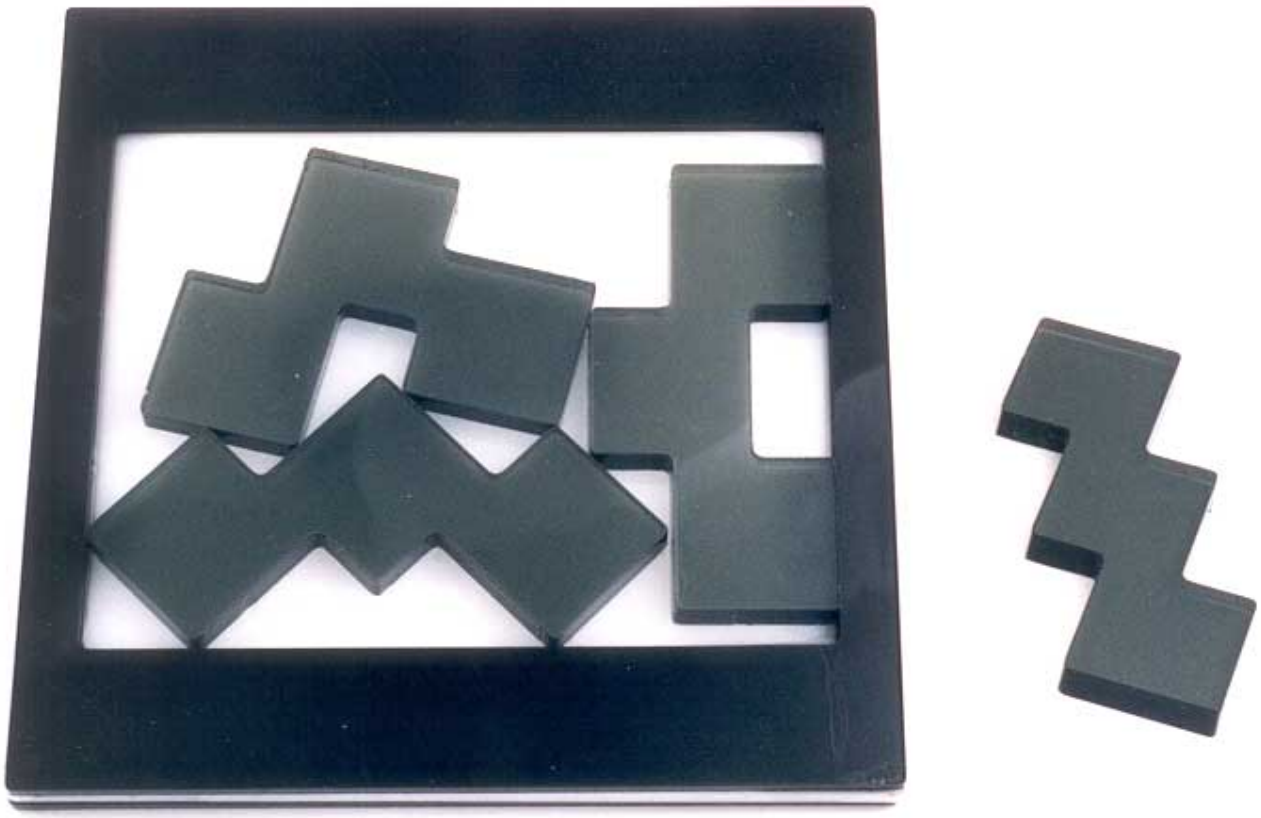
Puzzle Goal:

Fit all four pieces into either side of the tray.

Materials:

¼" smoked acrylic (pieces), 1/8" black acrylic (top and bottom of tray), 1/8" white acrylic (middle of tray)

Classification: ASS-CART (2D)



Notes:

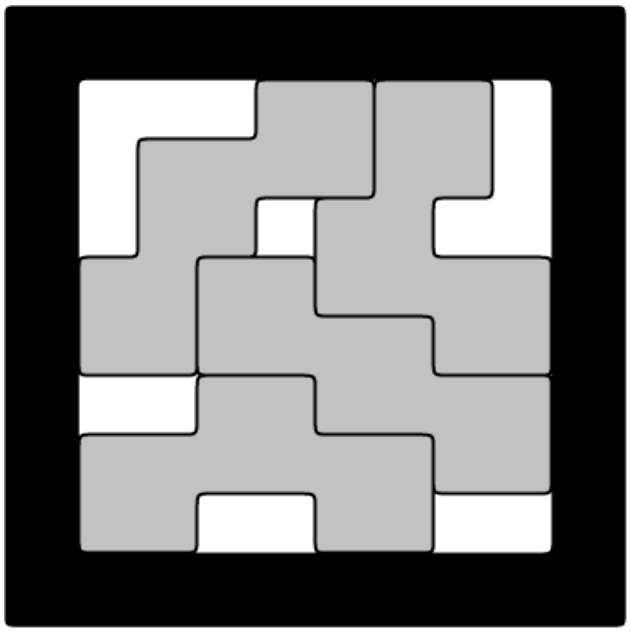
The four pieces in this puzzle comprise a logically complete set. This set is defined as follows: arrange three unit squares so that every square shares exactly half an edge with any other square.

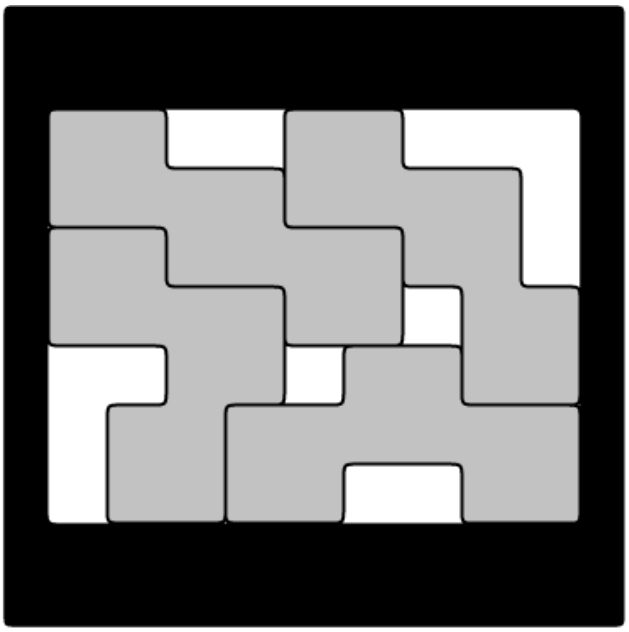
Each side of the tray has a unique solution.

Copyright © 2002 IPP Design Competition
All rights reserved.

47 Square Dance

Puzzle Solution:





Copyright © 2002 IPP Design Competition
All rights reserved.

48 Stacked Pieces Puzzle Ring

Puzzle Goal:

Assemble a puzzle ring from the four pieces

Materials:

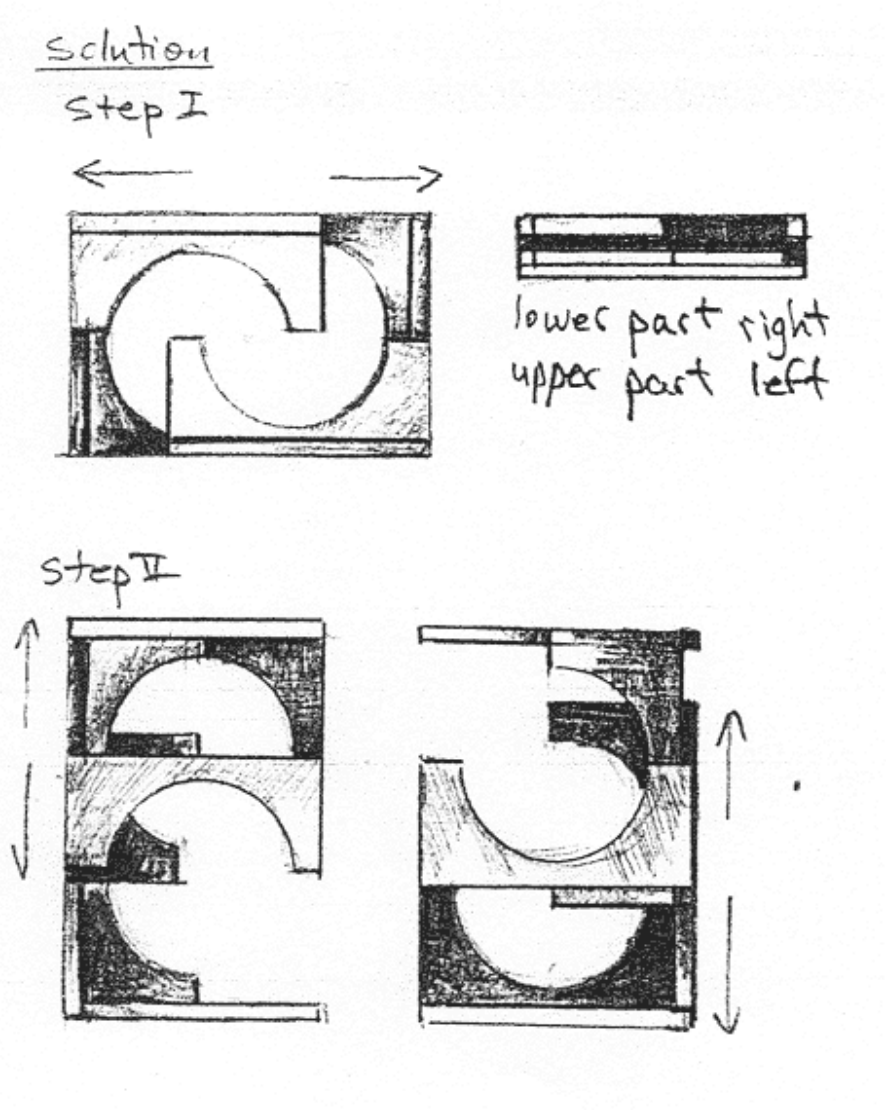
Sterling silver

Classification:

Copyright © 2002 IPP Design Competition
All rights reserved.

48 Stacked Pieces Puzzle Ring

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

49 Stealth

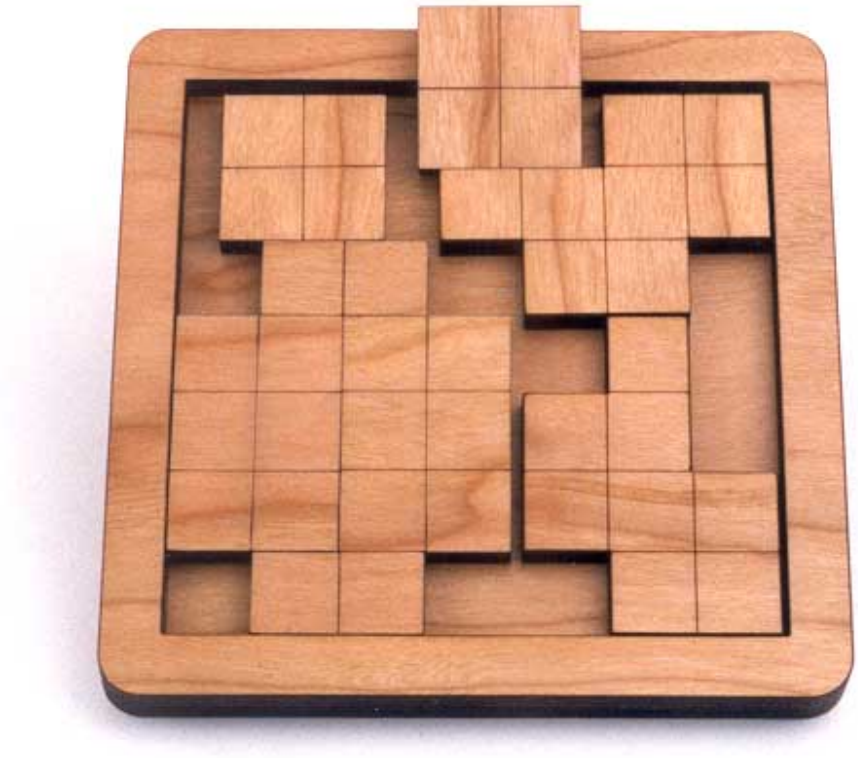
Puzzle Goal:

Pack the 4 octominoes and 2 tetrominoes flat into the 7x7 square tray.

Materials:

Cherry wood

Classification: Put-Together



Copyright © 2002 IPP Design Competition
All rights reserved.

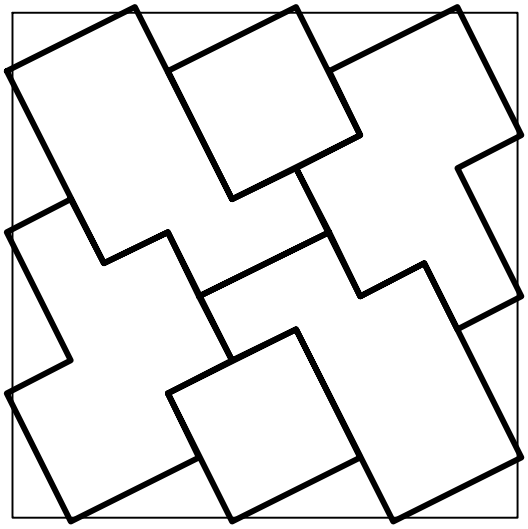
49 Stealth

Puzzle Solution:

If the tray is 7x7, Stealth has no solutions. But the length of the square box is made slightly bigger at:

$$\frac{16}{\sqrt{5}} \approx 7.156\ units$$

Thus giving a unique solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

50 Strip Tease

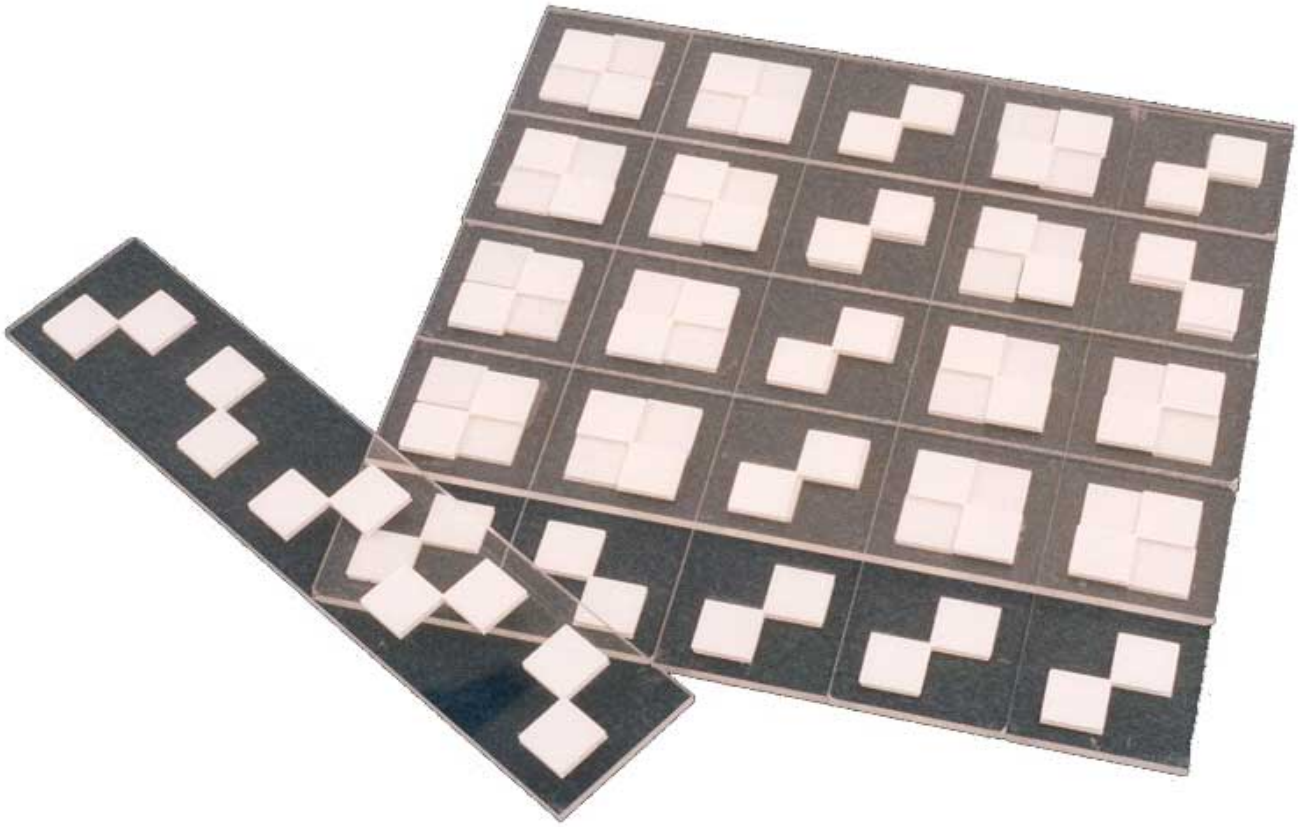
Puzzle Goal:

The purpose of the puzzle is to place 5 strips horizontally and 5 strips vertically so that a pattern of 25 full squares results.

Materials:

Clear acrylic

Classification: Put-together



Notes:

Each strip consists of 5 patterns of 2 diagonally place one-quarter squares. Each strip is different and only 10 different strips exists (all included).

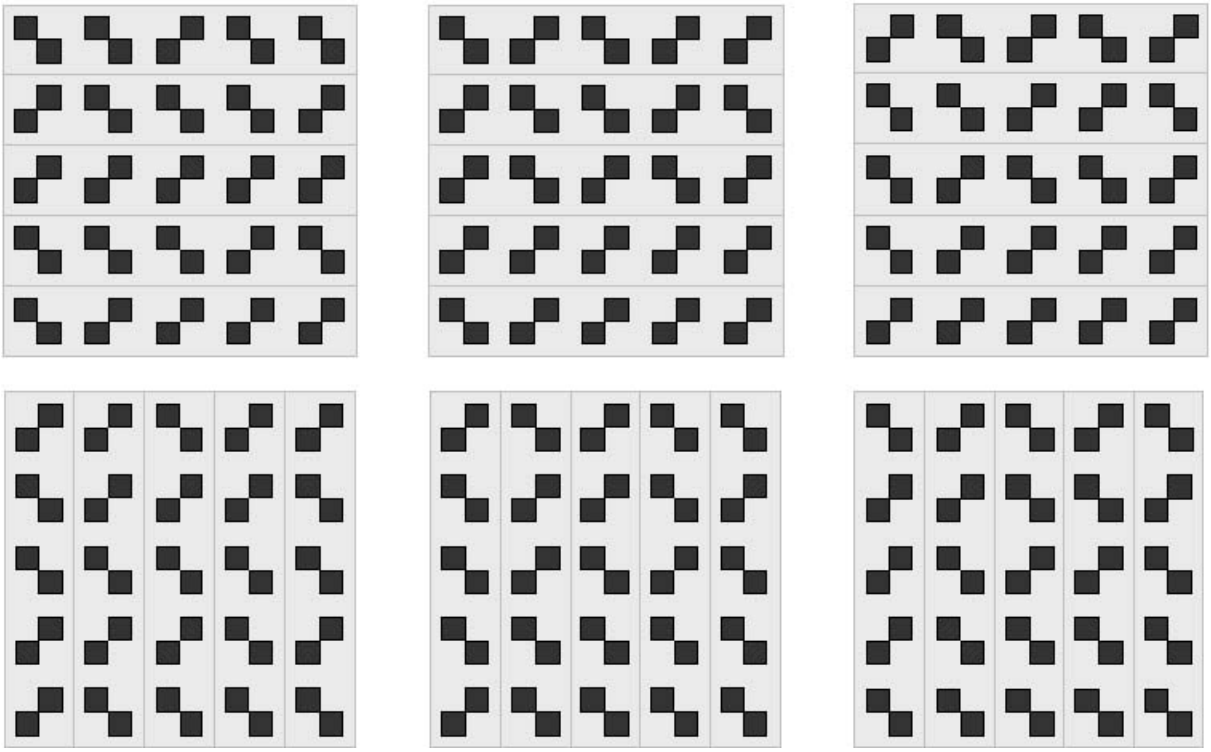
Copyright © 2002 IPP Design Competition
All rights reserved.

50

Strip Tease

Puzzle Solution:

Example Solutions:



Copyright © 2002 IPP Design Competition
All rights reserved.

51 Taxi

Puzzle Goal:

Take the two pieces apart. Then put them back together again, forming one complete taxi.

Materials:

Maple with Mozambique inlay

Classification: Take-apart, route finding

Notes:

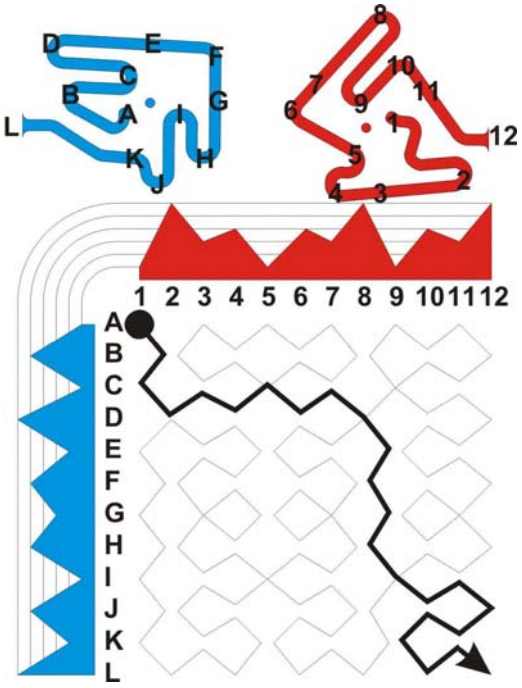
The pegs holding the cars are delicate; please take care not to force the puzzle in any way.

Copyright © 2002 IPP Design Competition
All rights reserved.

51 Taxi

Puzzle Solution:

A1,B2,C1,D2,C3,D4,C5,D6,C7,D8,E9,F8,G9,H8,
I9,J10,I11,J12,K11,J10,K9,L10,K11,L12, OUT



Copyright © 2002 IPP Design Competition
All rights reserved.

52 Tetralott

Puzzle Goal:

Assemble the seven puzzle-pieces to a ball pyramid (tetrahedron). To connect the pieces use the additional pins.

Materials:

walnut

Classification: put together

Copyright © 2002 IPP Design Competition
All rights reserved.

52 Tetralott

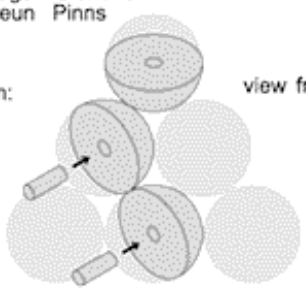
Puzzle Solution:

1 Legen Sie das Teil Nr. 1 auf den Tisch und fügen Sie zwei der neun Pinns hinzu

Put piece nr. 1 on the table an add two of the nine pins

Sicht von oben:

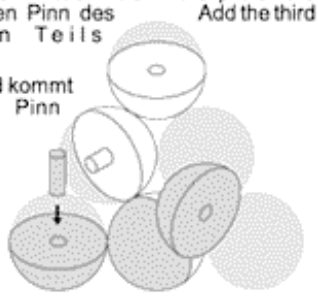
view from above:



2 Die mittlere Halbkugel des zweiten Teils wird auf den Pinn des ersten Teils gesteckt.

Anschließend kommt der dritte Pinn hinzu.

The middle half-ball of the second piece will be put on the pin of the first piece. Add the third pin.

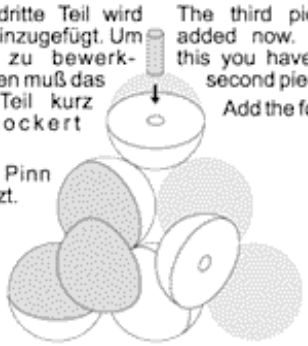


3 Das dritte Teil wird nun hinzugefügt. Um dies zu bewerkstelligen muß das zweite Teil kurz etwas gelockert werden.

Der vierte Pinn wird eingesetzt.

The third piece will be added now. To manage this you have to pull the second piece a little bit.

Add the fourth pin

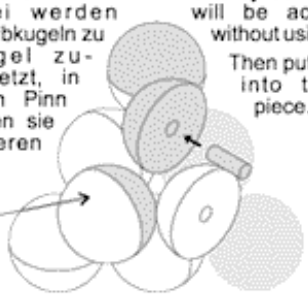


4 Setzen Sie das vierte Puzzleteil auf den vorderen Pinn. Dabei werden zwei Halbkugeln zu einer Kugel zusammengesetzt, in welcher kein Pinn gehört! Fügen sie einen weiteren Pinn hinzu.

Kugel ohne Pinn

Put the 4th puzzle-piece onto the pin directing to the front. By doing this a ball will be accomplished without using a pin!

Then put the next pin into this added piece.

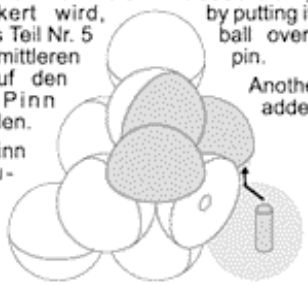


5 Indem das soeben eingesetzte 4. Teil wieder etwas gelockert wird, kann das Teil Nr. 5 mit seiner mittleren Halbkugel auf den aktuellen Pinn gesteckt werden.

Ein weiter Pinn wird hinzugefügt.

The just added 4th piece has to be loosen a little bit to add the 5th puzzle-piece by putting its mittle half-ball over the actual pin.

Another pin will be added.

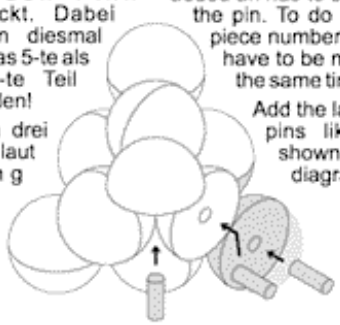


6 Das Teil Nr. 6 wird auf den Pinn gesteckt. Dabei müssen diesmal sowohl das 5-te als auch das 4-te Teil gelockert werden!

Die restlichen drei Pinns werden laut Zeichnung eingesetzt.

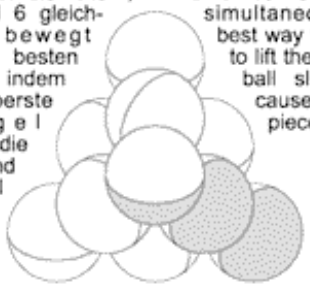
The piece number 6 will be added an has to be put on the pin. To do so even piece number 5 and 4 have to be moved at the same time.

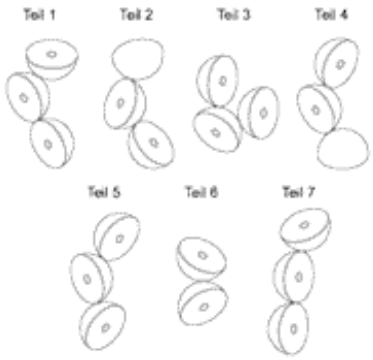
Add the last three pins like it is shown in the diagram.



7 Um das letzte Teil einfügen zu können müssen die Teile 4, 5 und 6 gleichzeitig bewegt werden. Am besten gelingt dies, indem man die oberste Halbkugel vorsichtig in die Höhe zieht und das 7-te Teil einsetzt.

To add the last piece the pieces number 4, 5 and 6 have to be moved simultaneously. The best way to do this is to lift the upper half-ball slightly. This causes the other pieces to move.





Copyright © 2002 IPP Design Competition
All rights reserved.

53 Train of Gears

Puzzle Goal:

Set the 11 given gears on each of the eleven pegs such that if you spin any of the four wheel gears, all of the other wheel gears will spin in the same direction.

Materials:

plastic

Classification: Assembly puzzle, ASS-OTH

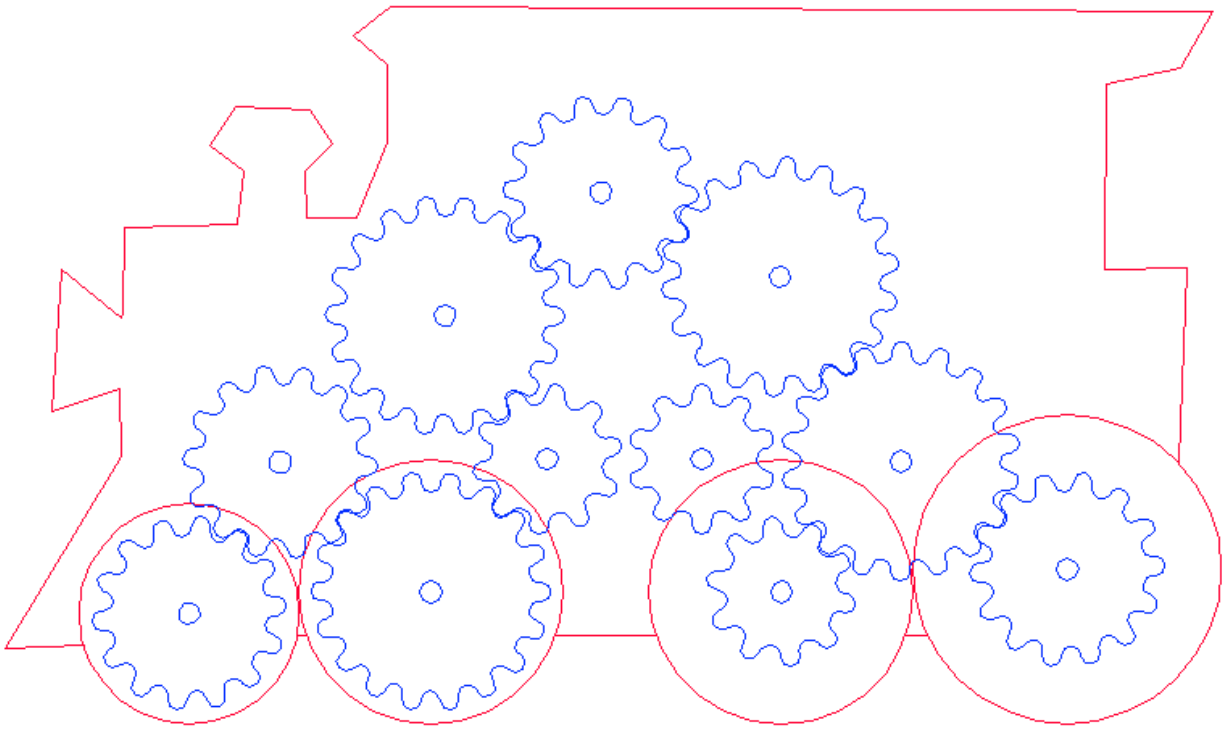
Notes:

The instructions above more precise than that given on the puzzle.

Copyright © 2002 IPP Design Competition
All rights reserved.

53 Train of Gears

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

54 Tricolore

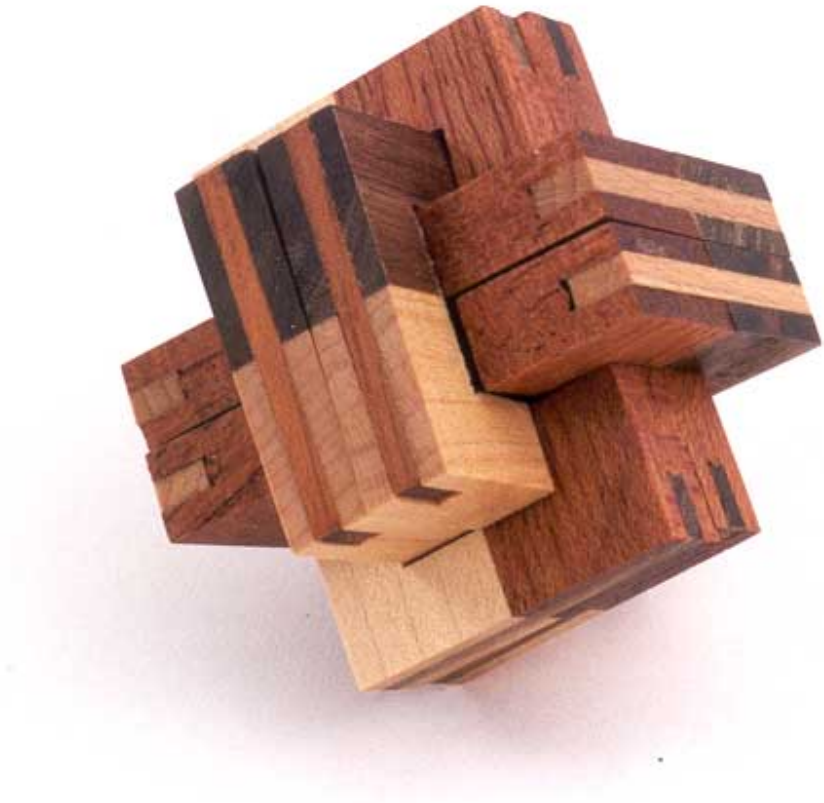
Puzzle Goal:

Assemble the six pieces into a three dimensional cross, respecting the colors of the three pairs of pieces. Rotation of the pieces is neither necessary nor allowed.

Materials:

Wood, Walnut (dark wood), Hard Maple (light wood), and Jotaba (aka Brazilian Cherry), decorative splines from the same three woods.

Classification: 3.4 Burrs



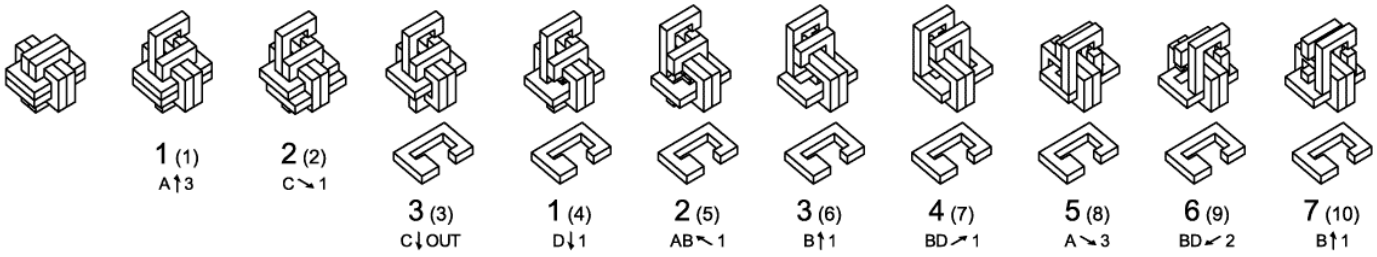
History:

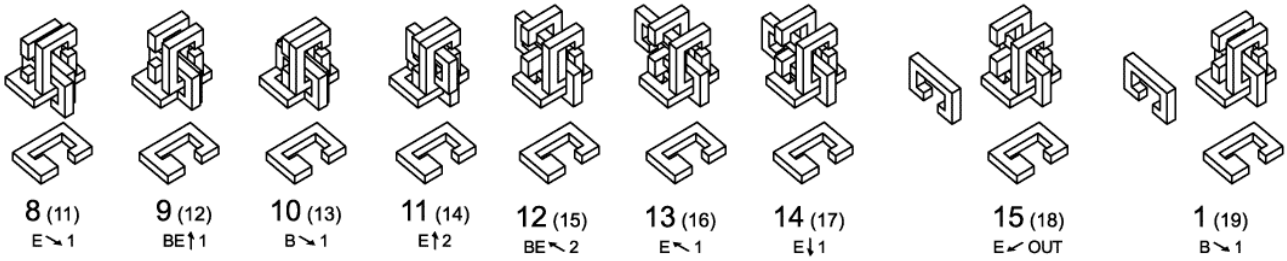
This puzzle is one of the products of an extensive research where all six board burrs were calculated. This is one of the four "most interesting" designs discovered.

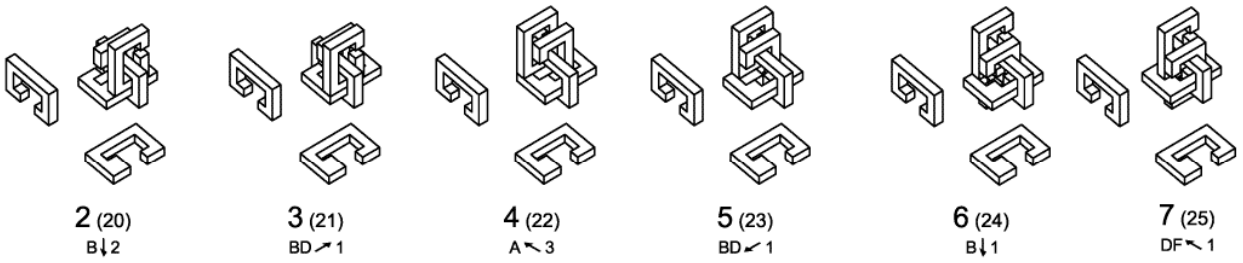
Copyright © 2002 IPP Design Competition
All rights reserved.

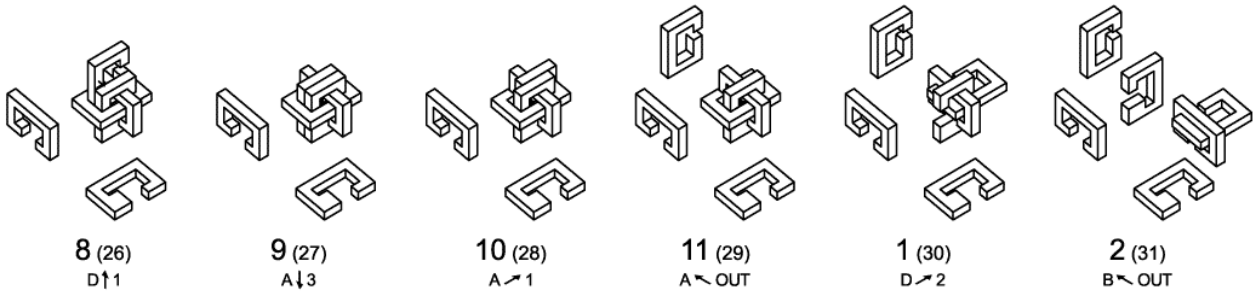
54 Tricolore

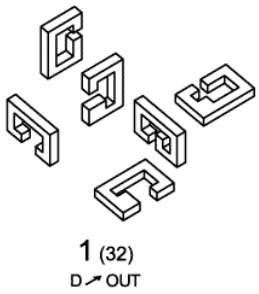
Puzzle Solution:











Tricolore (level 3-15-1 1-2-1, 32 moves)
ASM 505, 1368 assemblies, 89 solutions, 53 partial solutions

Copyright © 2002 IPP Design Competition
All rights reserved.

55

Triplets

Puzzle Goal:

Disassemble, and then reassemble, the pieces into the shape of the classic Three-Piece Cross

Materials:

Zebrawood finished with Velvit Oil.

Classification: Interlocking Puzzle

History:

I was looking for new ways to make puzzles based on the traditional Three-Piece Cross (or Wooden Knot). This investigation led to an article in Cubism For Fun ("Analysis of the Three-Piece Cross", CFF 53) and a very interesting, level 8-4 design by Frans de Vreugd (Three Piece NOT).

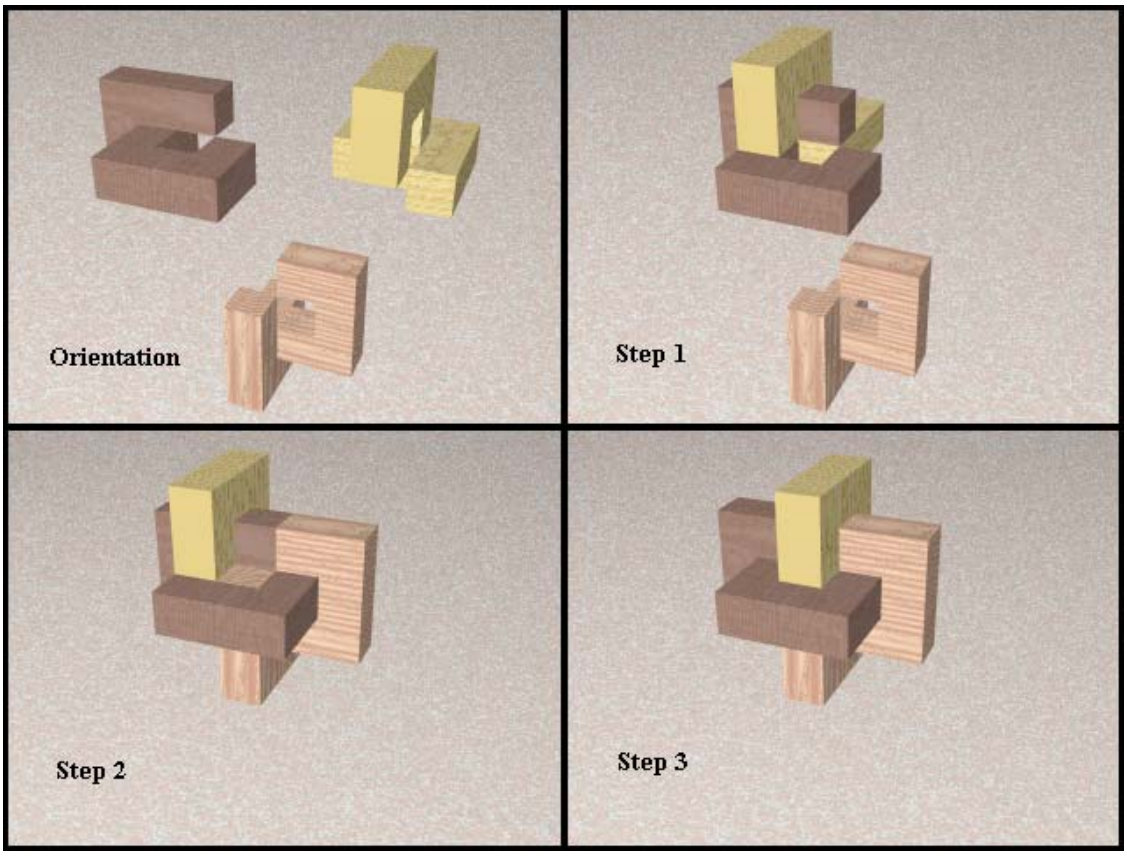
Triplets was an offshoot of this work, something I did one day to relieve the tedium of manually trying combinations of pieces for the above-mentioned work. I had tried earlier (as had many others, I found later) to create a 3x3x3 cube puzzle with three identical pieces. I thought I might have better luck with the shape of the Three-Piece Cross. I built up the basic piece with cubes, using Gordon Lingard's program, Interlock. Once I had a shape that I thought would work I used André van Kammen's program, Puzzlesolver, to look for unexpected, easier solutions. I was surprised to find the solution was unique.

Later I saw a design on a Japanese website that creates a six-board puzzle using the same dissect-and-reattach approach. This puzzle, named "Crooked 6 Board Burr", was designed by Junichi Yananose, and the pieces are similar in design.

Copyright © 2002 IPP Design Competition
All rights reserved.

55 Triplets

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

56 Twin Cubes

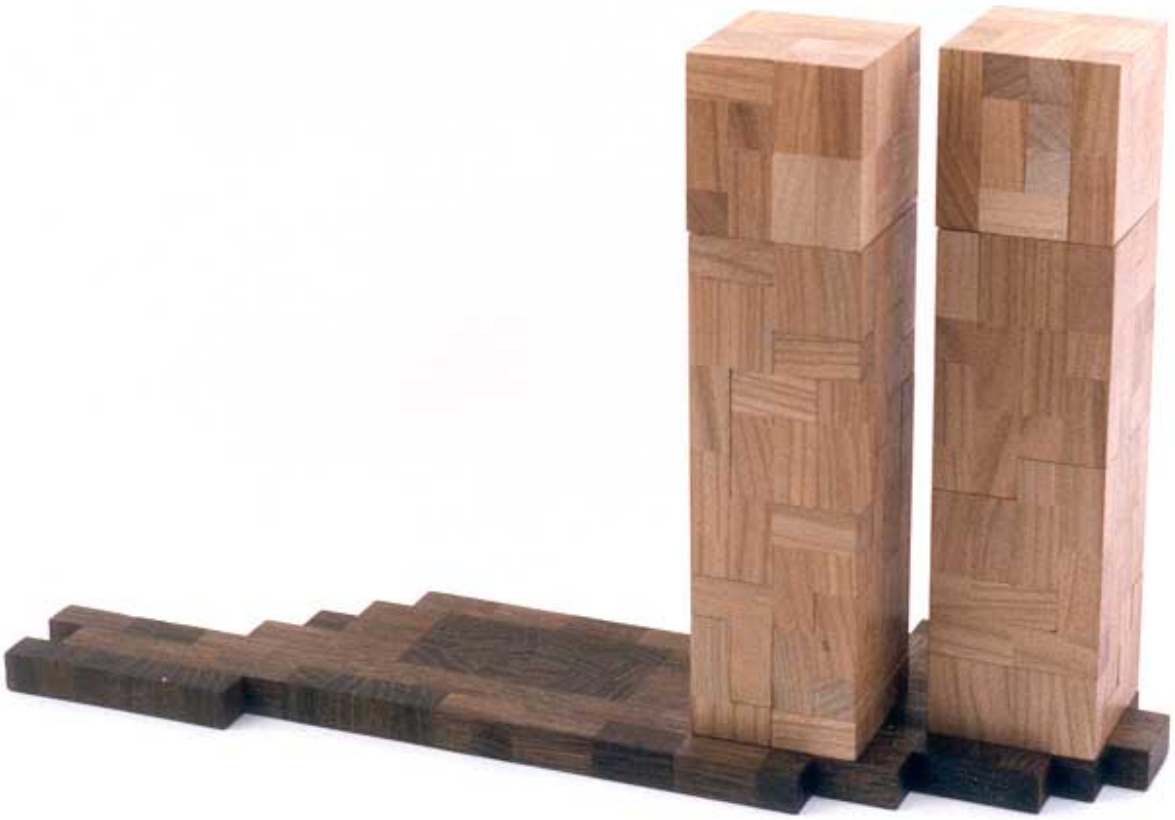
Puzzle Goal:

Assemble each of the two cubes. Additionally, each of the presentation towers can be disassembled and reassembled.

Materials:

Cubes and towers: cherry wood; Manhattan: wenge and oak.

Classification: interlocking



Copyright © 2002 IPP Design Competition
All rights reserved.

56 Twin Cubes

Puzzle Solution:

Solution for the four piece cube:

```
ACCC AACD AACD AAAD
BCCC BBCD BACC BBAD
BBCC BBBD BAAA BBBD
BBBC DDDD DAAA DDDD
```

At first remove piece B, then move A down and rotate it against the clock. After this C can be removed by an S-shaped movement, rotate it clockwise left up first and then anticlockwise left up.

Solution for the five piece cube:

```
EEEF GEEH GGHH HHHH
EFFF IEEH GHEH HHFH
EFFF IIFG GGGG HFFF
EEEF HIEF HIIF HFIF
```

At first remove piece H, followed by piece I. Then something very interesting happens. When F is chosen to be on a fixed position, at the very beginning E can only be moved when G is moved and vice versa.
While rotating piece G against the clock, E must move to the left. After doing this for a while all three pieces automatically separate.

Tower 1, 5 pieces, on top of which the 4 piece cube must be placed:

```
AAAA A..A A..A AABA
AAAA B..A A..A AABA
CCCC B..A B..B ABBA
CAAA B..A B..B BBBB
CCCC C..C B..B BBBB
CCCC D..C B..C CCBB
CCDD D..C B..C CCCC
DDDD D..D C..C CCCC
DDDD D..D D..E CEEE
EDDE D..D D..E CCCC
EEDE E..E D..E EEEE
EEDE E..E E..E EEEE
```

How to take tower 1 apart: move C; move B; move A; remove A; remove B; remove D and E in a similar way.

Tower 2, 6 pieces, on top of which the 5 piece cube must be placed:

```
AABB A..B A..B AABB
BBBB B..C B..B BACB
BBCC D..C A..C AACB
BCCF D..C A..C ACCC
BFFF D..C A..C CCEE
BFFF D..F A..C EEEE
BBBB D..F A..C AAAE
BBDD D..F D..C AAAE
DDDF D..F D..C ADEE
EDFF D..F D..C DDEE
EDFE E..E D..E EEEE
EEFF E..F E..F EEFF
```

Tower 2: move A+B+C together; move C; move B; remove A; remove B; remove C; take D, E and F apart in a similar way.

Copyright © 2002 IPP Design Competition
All rights reserved.

57 Twist

Puzzle Goal:

Construct four differently colored intersecting rings fitting inside a rhombic dodecahedron.

Materials:

Black Walnut, White Ash, Mahogany, Jatoba

Classification: put-together/ INT-OTH

History:

The idea was born after making a copy of the Twelve Piece Twist burr. This construction can be regarded as three orthogonally intersecting (square) rings. Translating this concept to other polyhedra gave birth to the Twist. It works for both the rhombic dodecahedron and the rhombic triacontrahedron as they have rhombi as faces. I chose the dodecahedron for more rigidity.

Copyright © 2002 IPP Design Competition
All rights reserved.

57 Twist

Puzzle Solution:

There are two types of pieces (A and B) in four colors (p, q, r and s). Of each type there is only one rounded specimen, the key. Two different type pieces combined are called a cross. A specific piece is designated by a two letter group indicating type and color. For instance Ap is a piece of type A and with color p.

If the key of type A has color p and the key of type B color q, start the construction with cross (Aq,Bp) and keep keycross (Ap,Bq) aside. Connect crosses (Ap,Br), (Ap,Bs), (Ar,Bq) and (As,Bq) matching different types and same colors. Continue this process until only the key-cross remains. Insert the keycross and turn it clockwise 45 degrees to lock the puzzle.

Copyright © 2002 IPP Design Competition
All rights reserved.

58

Twisted Burr

Puzzle Goal:

Assemble the burr.

Materials:

Teak

Classification: Take apart

Notes:

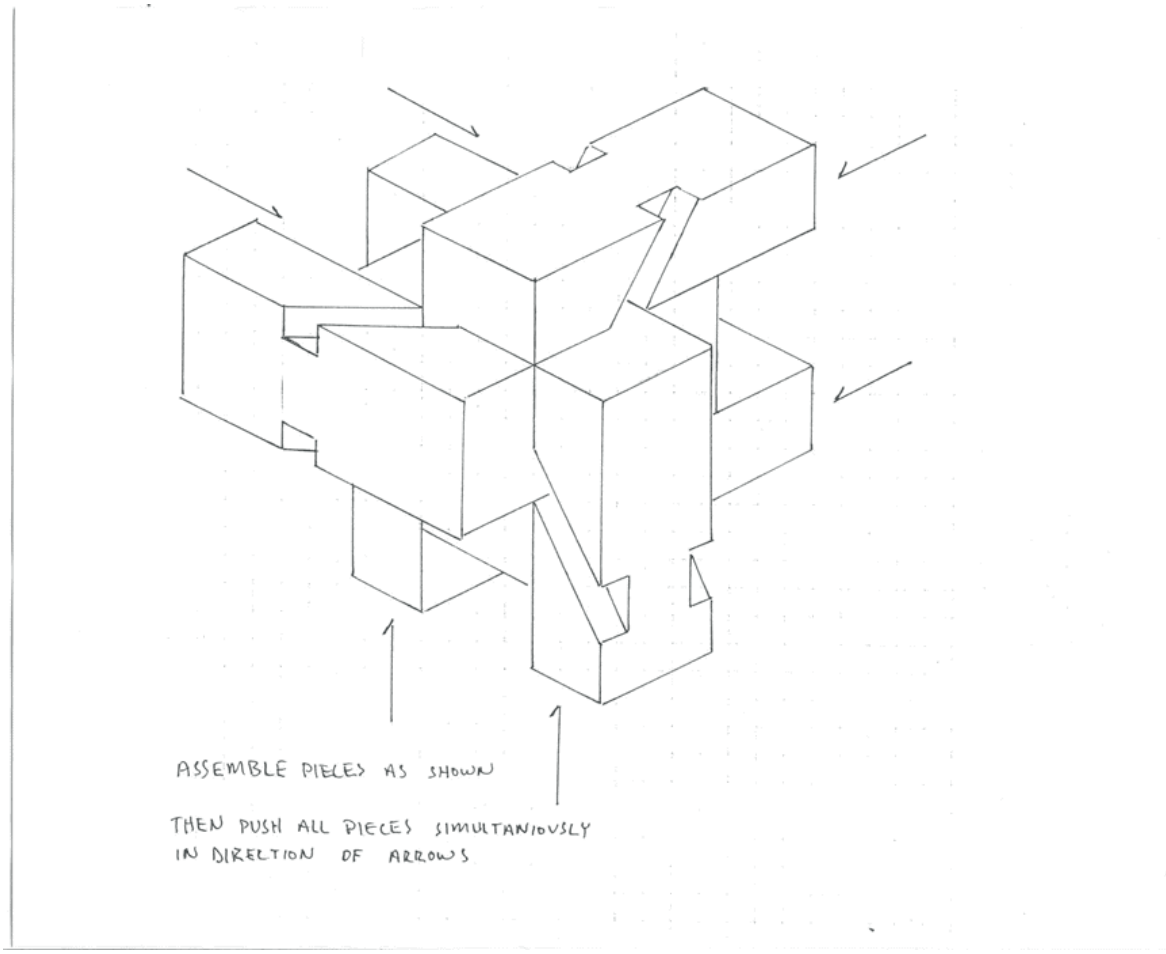
There are two completely unique assembly techniques.

Copyright © 2002 IPP Design Competition
All rights reserved.

58 Twisted Burr

Puzzle Solution:

One solution requires simultaneously sliding all six blocks into place. The other requires that you build each half separately and slide the two halves together. Once you find one solution to the puzzle see if you can find the other.



Copyright © 2002 IPP Design Competition
All rights reserved.

59

Two Brothers

Puzzle Goal:

Remove the metal ring.

Materials:

Birch wood, metal ring and polyester rope

Classification: Disentanglement

Copyright © 2002 IPP Design Competition
All rights reserved.

59

Two Brothers

Puzzle Solution:

Copyright © 2002 IPP Design Competition
All rights reserved.

60

Visible Box

Puzzle Goal:

Open the box.

Materials:

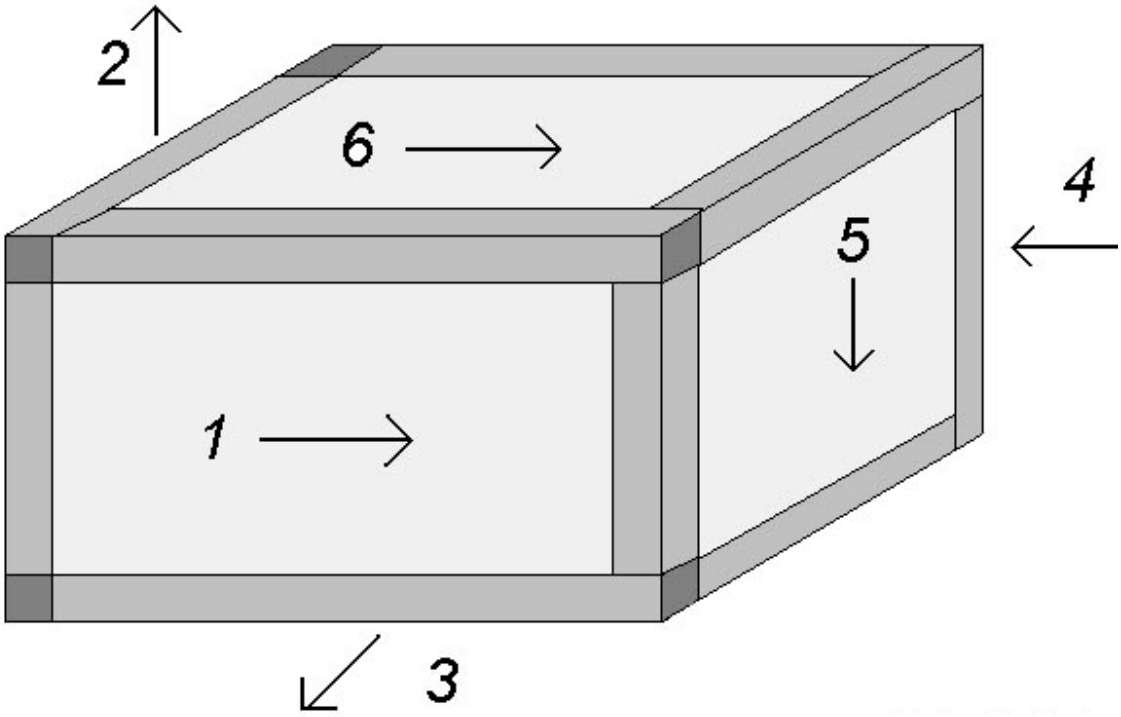
Cherry, Bloodwood

Classification: Take-apart Puzzle

Copyright © 2002 IPP Design Competition
All rights reserved.

60 Visible Box

Puzzle Solution:



Copyright © 2002 IPP Design Competition
All rights reserved.

61 ZigZag

Puzzle Goal:

Assemble the six pieces into a shape described as "separated board burr".

Materials:

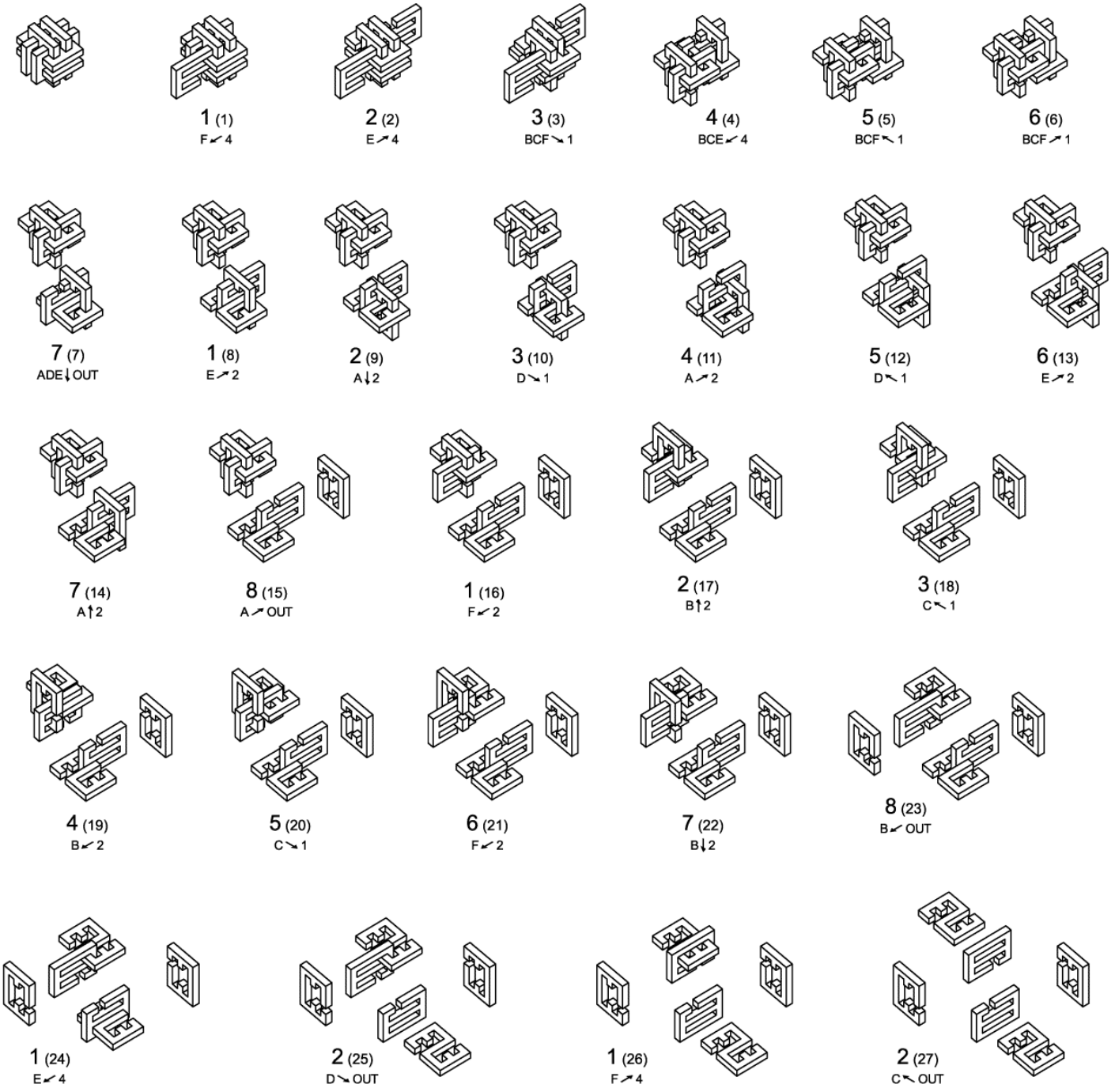
Lasercut acrylic pieces

Classification: 3.4 Burrs

Copyright © 2002 IPP Design Competition
All rights reserved.

61 ZigZag

Puzzle Solution:



Zigzag (level 7-8-8-2-8, 27 moves)

Copyright © 2002 IPP Design Competition
All rights reserved.